ORDER NO. KM40007643A2

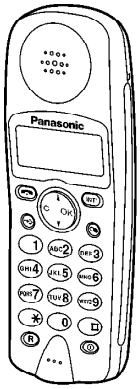
Service Manual

Telephone Equipment

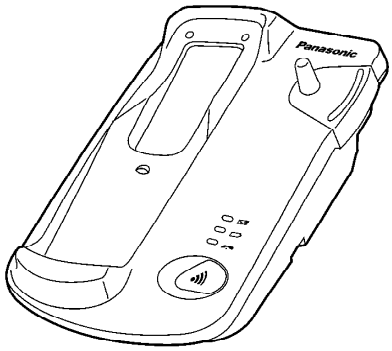
KX-TCD952NLB

Digital Cordless Phone

(for Holland)



(HANDSET)



(BASE UNIT)

SPECIFICATIONS

SPECIFICATION

Standard:	DECT=Digital Enhanced Cordless Telecommunications GAP=Generic Access Profile (herstellerubergreifendes DECT-Funkubertragungs verfahren)
Number of channels:	120 Duplex Channels
Frequency range:	1.88 GHz to 1.9 GHz
Duplex procedure:	Time Multiplex, 10 ms frame length
Channel Spacing:	1728 kHz
Bit rate spacing:	1152 kbit/s
Modulation:	GFSK
Voice coding:	32 kbit/s
Operation range:	Up to 300 m outdoors, up to 50 m indoors
Analog telephone connection:	Telephone Line / PBX
Power source:	AC Adaptor 230 V ~ /50 Hz
Power consumption, Base unit:	5 VA

Battery life, Handset (if batteries are fully charged):	Stand-by: Up to 65 hours (Ni-Cd) Talk: Up to 6 hours (Ni-Cd)
Operating conditions:	5˚- 40˚C, 20 - 80% relative air humidity (not condensing)
Dialing modes:	Pulse/Tone
Recall button (set default):	Flash (80 ms)
for PBX:	Flash (700 ms)
Recall button (option):	Earth (400 ms/1300 ms)
Dimensions, Base unit:	about 193 mm x 130 mm x 68 mm (L x W x D)
Dimensions, Handset:	about 160 mm x 56 mm x 31 mm (L x W x D)
Weight, Base unit:	about 270 g
Weight, Handset:	about 150 g
Telephone line cord length:	about 2.1 m
AC adaptor cord length:	about 2 m
Connection jack:	
AC adaptor cord:	Modular jack 6/4
AC adaptor Plug:	Euro jack

Design and specification are subject to change without notice.

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⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

Panasonic

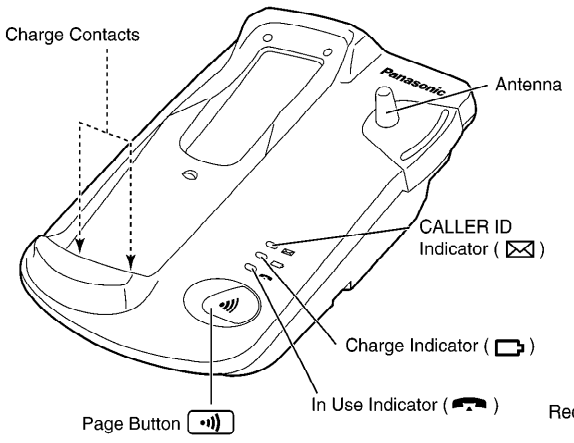
When you mention the serial number, write down all 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

FOR SERVICE TECHNICIANS

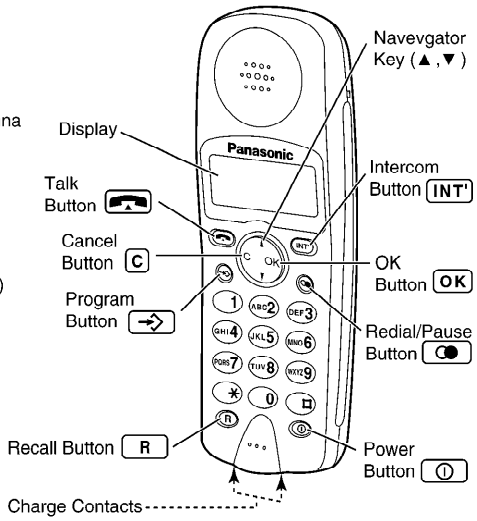
ICs and LSIs are vulnerable to static electricity.
When replacing, the following precautions will help prevent recurring malfunctions.
1. Cover the plastic parts boxes with aluminum foil.
2. Ground the soldering irons.
3. Use a conductive mat on the workable.
4. Do not grasp IC or LSI pins with bare fingers.

1. LOCATION OF CONTROLS

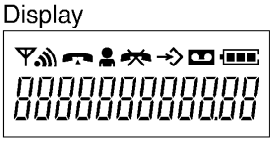
Base Unit



Handset



Display



Icons:

	The in range icon indicates that the handset is in range of the base unit. It flashes when the handset is out of range.
	The page/intercom icon is displayed when paging or using the intercom. It flashes when another unit pages the handset.
	The talk icon is displayed when making or answering calls. It flashes when an outside call is being received.
	The direct call icon is displayed when this mode is turned on.
	The call prohibition icon is displayed when this mode is turned on.
	The program icon indicated that the unit is in the programming mode.
	The battery icon indicates the battery strength.

Characters:

P		is pressed while dialing.			is pressed while dialing.
F	R	is pressed while dialing.			is pressed while dialing.

2. DISASSEMBLY INSTRUCUTIONS

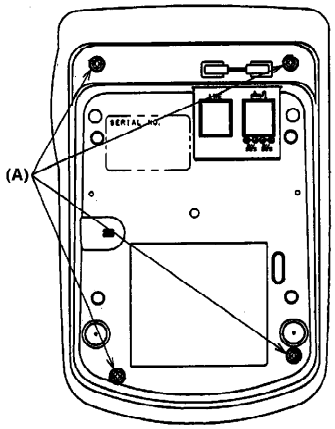


Fig. 3

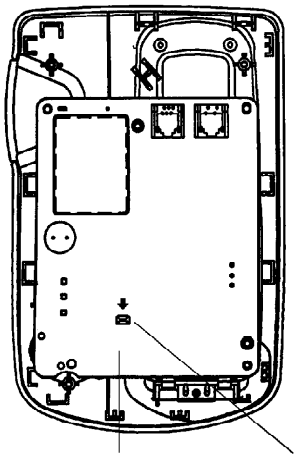


Fig. 4

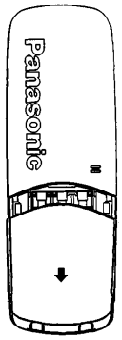


Fig. 5

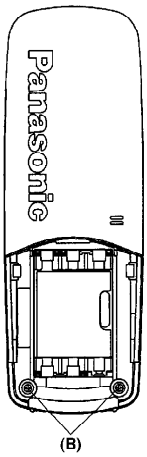


Fig. 6

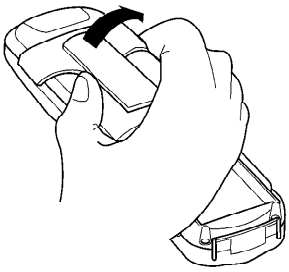


Fig. 7

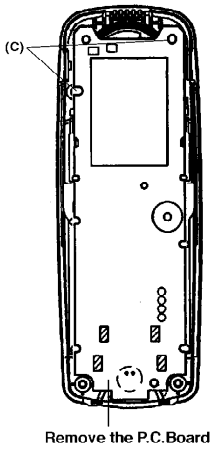


Fig. 8

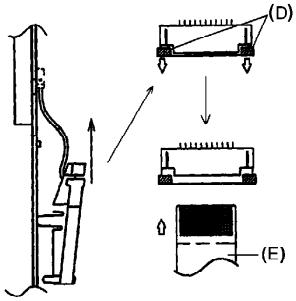


Fig. 9

Ref No.	Procedure	Shown in Fig.	To Remove	Remove
1	1	3	Lower Cabinet	Screws (3 × 14) ..... (A) × 4
2	1, 2	4	P.C. Board	Remove the P.C. Board
3	3	5	Battery Cover	Remove the Battery Cover
4	3, 4	6	Rear Cabinet	Screws (2.6 × 10) ..... (B) × 2
5	3~6	8	P.C. Board	Screws (2.6 × 10) ..... (C) × 2
6	3~7	9	LCD Lead	Pull the Connector Locks ..... (D) × 2
7	3~8			Pull the LCD Lead ..... (E) × 1

When removing the rear cabinet, attach the belt clip and press the belt clip as direction arrow. (Fig. 7)

3. SETTINGS

3.1. INSTALLING THE BATTERIES IN THE HANDSET

Install the batteries as shown. Then install the handset cover.

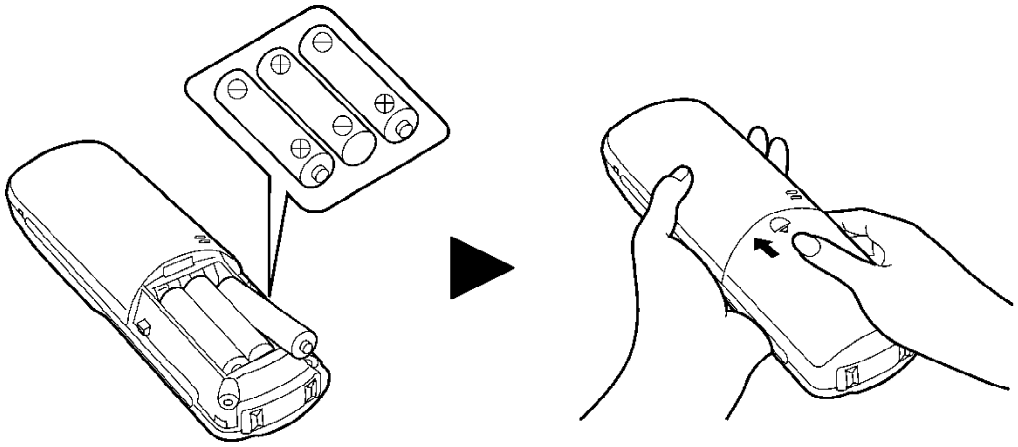
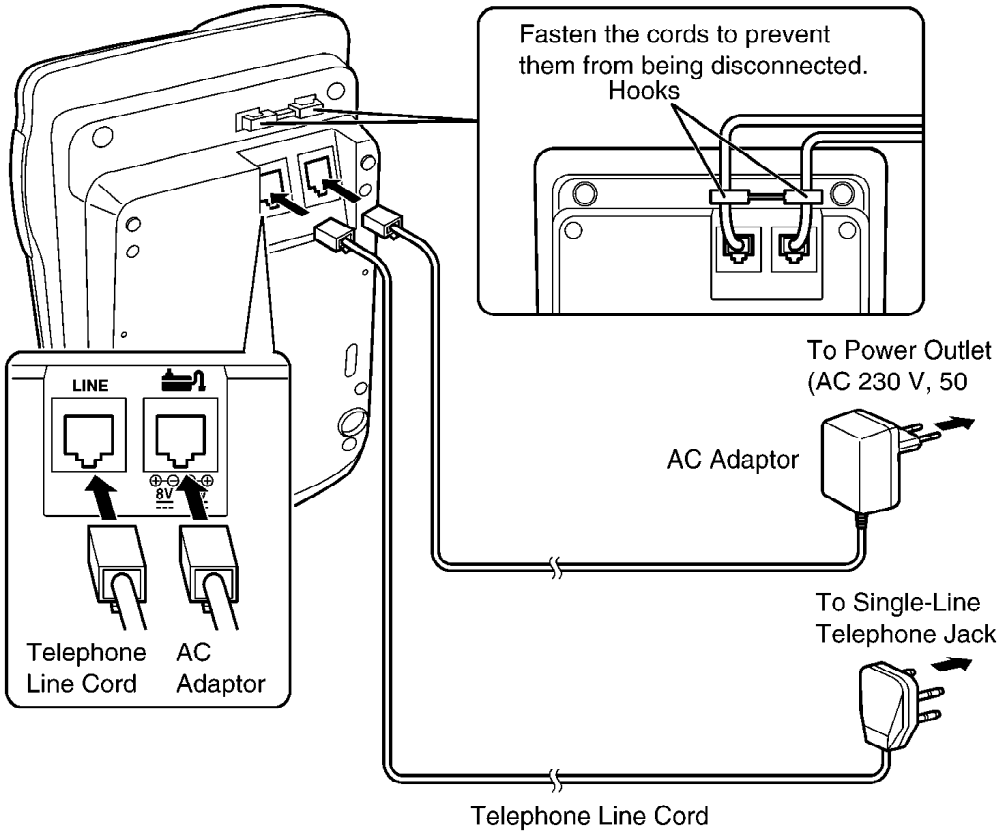


Fig. 10

- If the rechargeable batteries are not inserted correctly, the handset will not work.

3.2. CONNECTION

Plug in the AC adaptor cord and the telephone line cord to the bottom of the unit. Then connect the cords as shown.



- USE ONLY WITH Panasonic AC ADAPTOR KX-TCA11CE.

- Be careful not to confuse the telephone line jack with the AC adaptor jack on the base unit. If connected improperly, the base unit will not work and damage may occur.

- **The AC adaptor must remain connected at all times. (It is normal for the adaptor to feel warm during use.)**
- **The unit will not work during a power failure. We recommend you connect a standard telephone on the same line for power protection.**
- **If your unit is connected to a PBX which does not support Caller ID services, you cannot access those services.**

3.3. BATTERY CHARGE

At the time of shipment, the batteries are not charged. To charge, place the handset on the base unit. Please charge the batteries for about 4 hours before initial use.

•The charge indicator ( ) lights.

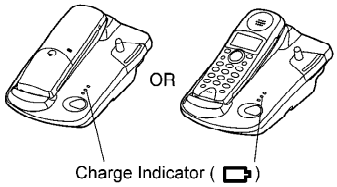


Fig. 12

Battery strength

You can check the present battery strength on the display.

Battery icon	Battery strength
	Fully charged
	Medium
	Low
(Flashing)	No power

Recharge

When " " flashes or the unit beeps every 15 seconds, recharge the batteries.

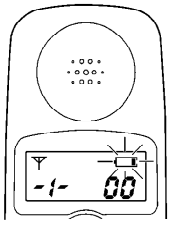


Fig. 13

Battery information

After your Panasonic batteries are fully charged:

Operation	Approx. Ni-Cd battery life (included)	Approx. Ni-MH battery life (Optional)*
While in use (Talk)	Up to about 6 hours	Up to about 12 hours
While not in use (Stand-By)	Up to about 65 hours	Up to about 130 hours

• Battery life may vary depending on usage conditions, such as:
-when viewing the Caller ID Caller List, and
-Ambient temperature.
• **Clean the handset and the base unit charge contacts with a soft, dry cloth.**
Clean if the unit is subject to grease, dust or high humidity. Otherwise the batteries may not charge properly.
• If the batteries are fully charged, you do not have to place the handset on the base unit until " " Flashes.
This will maximse the battery life.
• The batteries cannot be overcharged.
* Nickel metal hydride (Ni-MH) rechargeable batteries (AAA size) are available.
When you replace the batteries, you must program the battery type selection.

3.4. INSTALLING THE HANDSET CLIP

You can hang the handset on your belt or pocket using the belt clip.

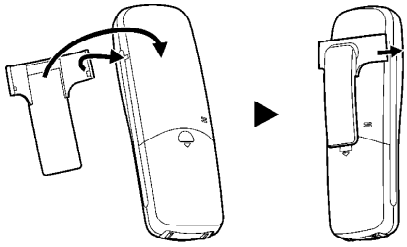


Fig. 14

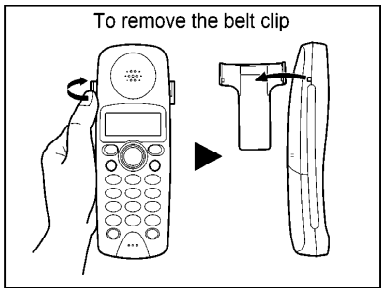


Fig. 15

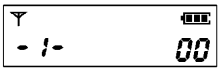
4. OPERATIONS

4.1. MAKING CALLS

4.1.1. TURNING THE POWER ON

Press ⏻ firmly.

• After all possible configurations briefly appear, the display will change to the following. Then the handset is in the stand-by mode.
The current connected base unit number is displayed.



• You can choose whether to display the base unit number, handset number or no display in the stand-by mode by programming.

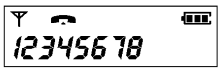
To turn the power OFF, press and hold ⏻ until a beep sounds.
• The display will go blank.
• The handset will not ring.

• Depending on the programming mode, you may not be able to turn the power off. First make sure the handset is set to the stand-by mode.

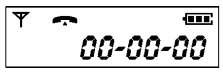
Make sure that the power is ON.

1 **Press 📞.**

2 **Dial a phone number.**
• The dialed number is displayed.



• After a few seconds, the display will start showing the length of the call.



3 **To hang up, press 📞 or place the handset on the base unit.**
• The handset will return to the stand-by mode.

4.1.2. TO DIAL AFTER CONFIRMING THE ENTERED NUMBER

1 **Enter a phone number.**
- The entered number is displayed.
- If you misdial, press C.
  Digits are erased from the right.
- To cancel, press C firmly.

2 **Press** .
- After a few seconds, the display will start showing the length of the call.

3 **To hang up, press or place the handset on the base unit.**
- The handset will return to the stand-by mode.
- If " " flashes and an alarm tone sounds after pressing , move closer to the base unit. Then try again.
- You can choose whether to display the length of the call or phone number in the talk mode by programming.

4.1.3. TO REDIAL THE LAST NUMBER DIALLED

Press → .
- The last number dialed is automatically redialed.

4.1.4. TO REDIAL AFTER CONFIRMING THE NUMBERS IN REDIAL MEMORY

The unit automatically stores the last 10 numbers dialed into redial memory.

1 **Press**
- The last number dialed is displayed.

2 **Select the desired number by pressing .**
- You can also search from the most recent to oldest number by pressing ▼. To search from the oldest to most recent number, press ▲.
- " " denotes the end of redial memory.
- To exit the list, press C firmly.

3 **Press**
- The number is dialed automatically.

4.2. ANSWERING CALLS

Make sure that the power is ON, otherwise the handset will not ring.

If the handset is off the base unit, press .

- You can also answer a call by pressing any dialing button 0 to 9, * or #.

Auto Talk
If you set the Auto Talk feature to ON, you can answer a call by lifting the handset off the base unit without pressing .

- The handset and base unit will not ring if both ringer volumes are set to OFF.

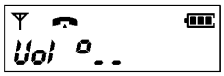
4.3. SETTING THE RECEIVER VOLUME

3 levels (HIGH, MEDIUM, LOW) are available.
The factory preset is MEDIUM.

While talking, press ▼ or ▲ to select the desired level.

• The display shows the volume level.

Ex. LOW is selected.



• After a few seconds, the display will return to the length of the call.

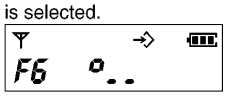
OR

In the stand-by mode, proceed as follows.

1 Press [→].

2 Press ▼ or ▲ until " F6 " is displayed, then press [OK].

• The current level is displayed.
Ex. LOW is selected.



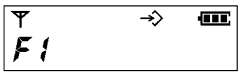
3 Press ▲ or ▼ to select the desired level.

4 Press [→].

4.4. SELECTING THE HANDSET RINGER VOLUME

6 levels are available. The lowest level is 1.
The highest level is 6. The factory preset is 3.
When set to OFF, the handset will not ring.

1 Press [→].

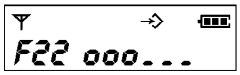


2 Press ▼ or ▲ until " F22 "is displayed.

3 Press [OK].

• The current volume is displayed and rings.

Ex. Level 3 is selected.



4 Press ▼ or ▲ to select the desired level.

• Each time you press a button, the selected volume is displayed and rings.
• To set to OFF, erase " o " by pressing ▼ until " bELL OFF " is displayed.

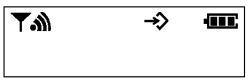
5 Press [→].

• A confirmation tone sounds and the display will return to the stand-by mode.
• When set to OFF, " bELL OFF " will be displayed.

4.5. SELECTING THE BASE UNIT RINGER VOLUME

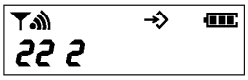
3 levels (HIGH, MEDIUM, LOW)
are available. The factory preset is MEDIUM.
When set to OFF, the base unit will not ring.
Make sure that the power is ON and the unit is in the stand-by mode.

1 Press [→] then [INT'].



2 Press [2] TWICE.

· The current volume is displayed.
1: LOW 2: MEDIUM 3: HIGH 0: OFF
Ex. MEDIUM is selected.



3 Press the desired volume level [1], [2], [3] or [0].

· Each time you press a button,the selected volume is displayed and rings.

4 Press [→].

· A confirmation tone sounds and the display will return to the stand-by mode.

5. HOW TO REPLACE THE RF UNIT OF HANDSET

When replacing the P.C. Board No. PQUP10927ZB and PQUP10927YA, the hotmelt removing and putting operation is required.

1. **Cool the P.C. Board in the freezer for 10 minutes, then remove the hotmelt of the hatched parts in Fig. 16 with the tip of minus screwdriver.**
2. **Remove the solder of each pin on RF unit, then remove the RF unit from the P.C. Board.**
3. **After soldering the new RF unit on the P.C. Board surely, put the hotmelt on the hatched part in the Fig. 16.**
4. **Note: / Above-mentioned hotmelt removing and putting operation is only for the P.C. Board No. PQUP10927ZB and PQUP10927YA.**
5. **There is no need of the hotmelt removing and putting operation for the PC Board No. PQUP10927ZC.**

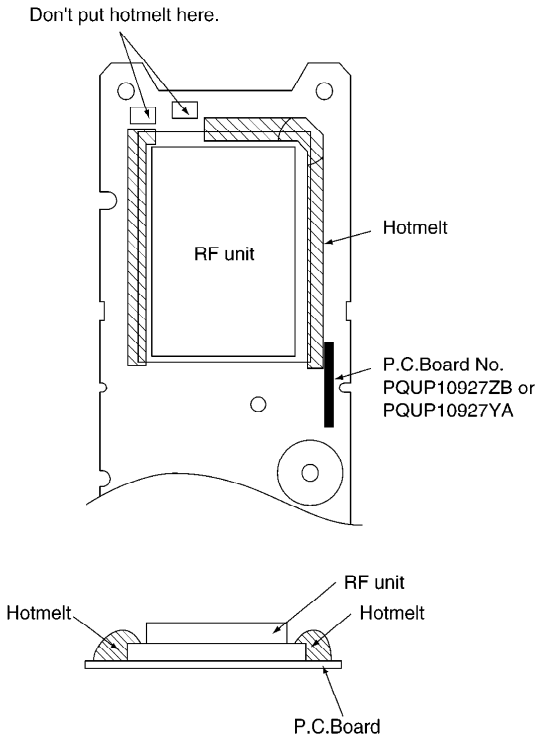


Fig. 16

6. BLOCK DIAGRAM RF UNIT (BASE UNIT)

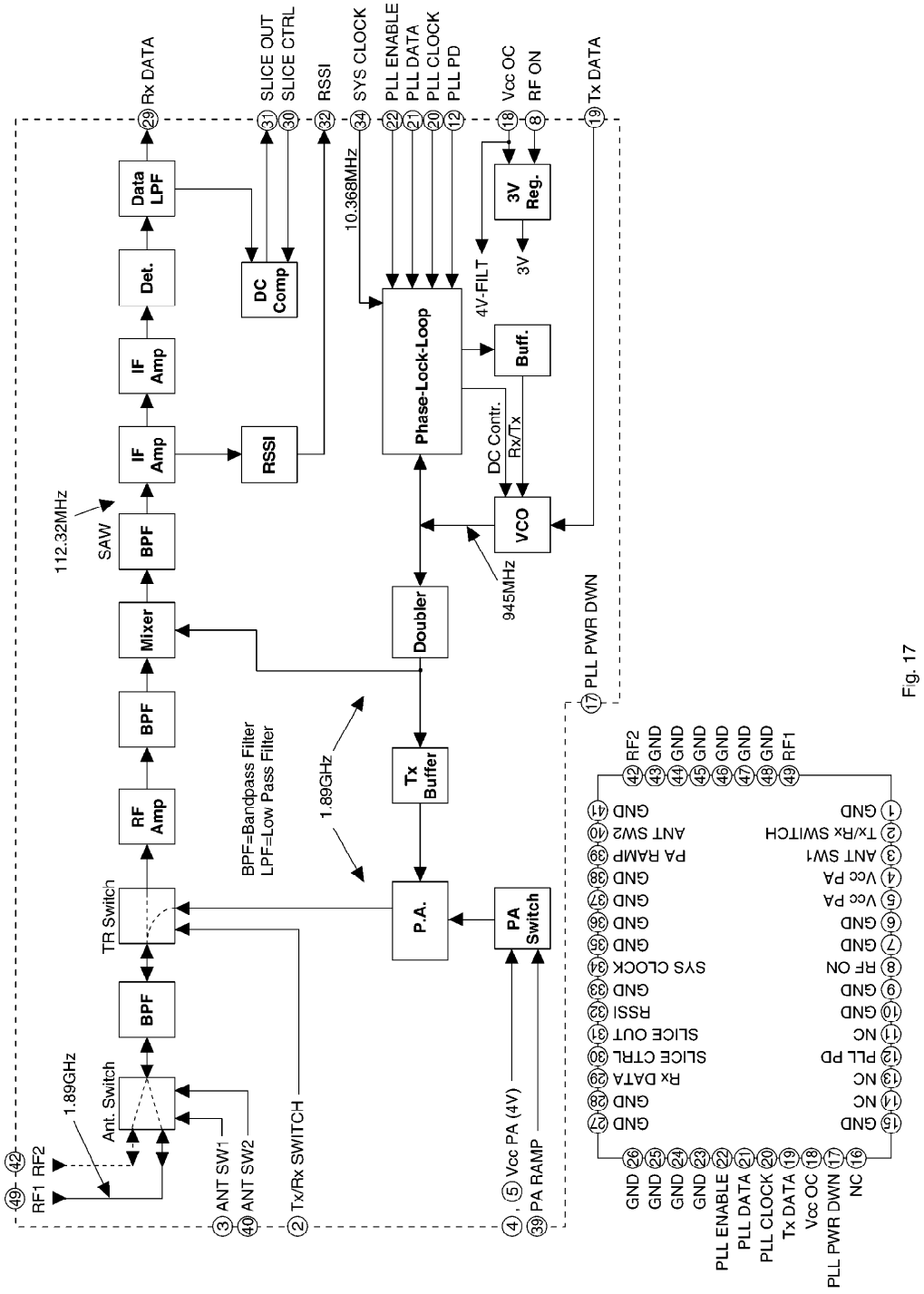


Fig. 17

7. BLOCK DIAGRAM BASEBAND SECTION AND LINE INTERFACE (BASE UNIT)

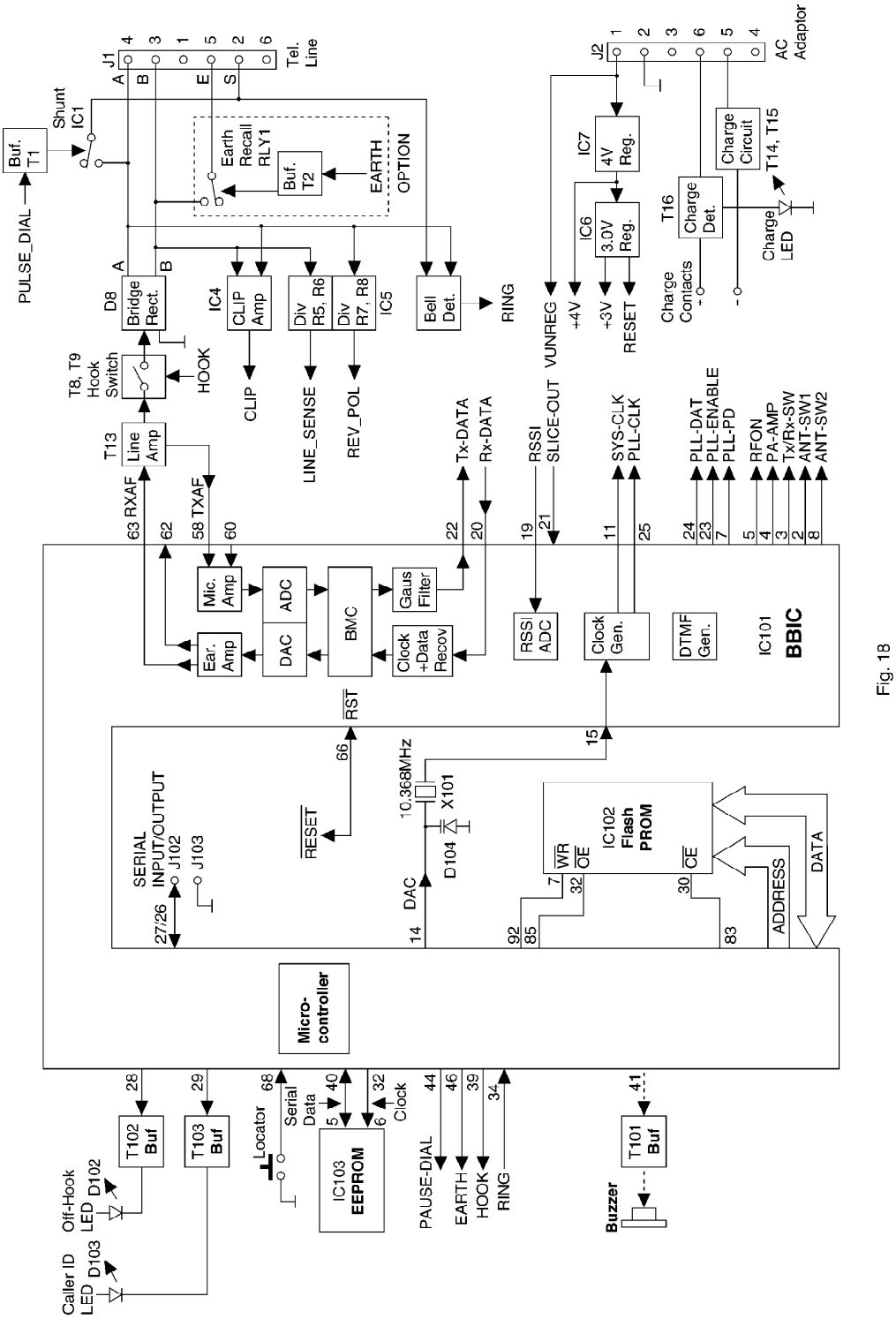


Fig. 18

8. CIRCUIT OPERATION (BASE UNIT)

8.1. R.F. SECTION (SEE BLOCK DIAGRAM Fig. 17)

8.2. THE BASE-BAND SECTION (SEE BLOCK DIAGRAM Fig. 18)

8.2.1. INTRODUCTION

The base-band section consists of a base-band integrated circuit (BBIC), a Flash PROM, an EEPROM, and an AND Gate.

8.2.2. THE BASE-BAND INTEGRATED CIRCUIT (BBIC)

The PQVINSC14424 (IC101) is a CMOS device designed to handle all the audio, signal and data processing needed in a DECT base unit. It contains a "burst mode controller" microprocessor which takes care of DECT specific physical layer and radio section control. It also contains two ADPCM transcoders, a low power 14 bit codec (ADC/DAC), various other ADC´s, DAC´s and timers, a gaussian filter for the DECT GFSK modulation method, clock and data recovery circuits, a clock oscillator circuit, a DTMF generator (DSP), an echo suppression circuit (DSP), and a pair of gain controllable audio amplifiers for line input and line output and a general purpose microcontroller. / The IC101 interfaces to its external PROM (IC102) via a data/address/ control bus. It connects to the EEPROM via a serial interface, and a second serial interface is used during manufacture and service to connect to an external computer.

8.2.3. FLASH PROM (SEE Fig. 19)

The 1 Mbit (IC102) Flash PROM contains the operational firmware for the microcontroller. It is interfaced to the data/address/control bus using address lines A0 to A16, data lines D0 to D7, and chip select (pin 30), output enable (pin 32), and write (pin 7).

8.2.4. EEPROM (SEE Fig. 19)

The electrically erasable PROM PQVINM4C32L (IC103) is used to store all the temporary operating parameters for the base (see EEPROM LAYOUT). It uses a two-line serial data interface with the BBIC, with bi-directional data on pin 5 (TP94), and clock on pin 6 (TP93).

8.2.5. CLOCK GENERATION (SEE Fig. 19)

A single clock generator in the BBIC uses an external crystal X101 to derive all clock frequencies used in the base. The crystal is tuned to the exact frequency of 10.368 MHz during manufacture by feeding a DC voltage from a DAC in the microcontroller (from pin 14 of IC101) to the varicap diode D104 (TP112). / The BBIC provide buffered clock signals RFCLK (pin 11, TP139) at 10.368 MHZ for the Frequency Synthesizer, which is only active during the PLL lock period. Other clock is SCLK on pin 1 (3.456MHz). The basic data rate for TRADAT and RECDAT is 1.152 Mbits/s, which is 10.368 MHs divided by 9. The data rate for the serial interface to the phase-lock-loop is also 1.152 Mbits/s.

Circuit Diagram

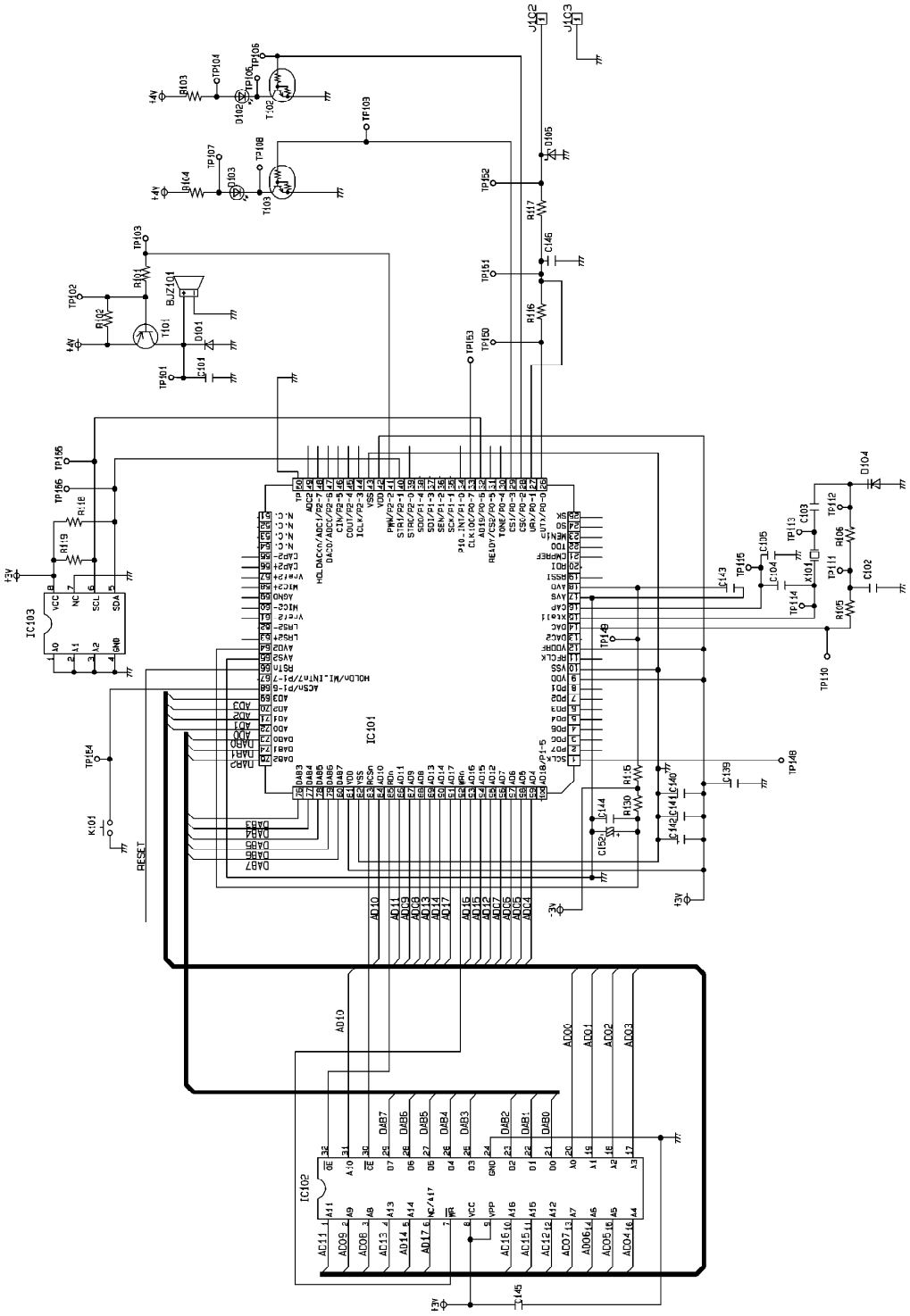


Fig. 19

8.2.6. LOCATOR KEY (SEE Fig. 19)

The keyboard “Locator (Page)” button is connected to pin 68 (TP154) of the IC101. When pressed the base transmits a message to the handset, which then beeps.

8.2.7. FACTORY SERIAL PORT (SEE Fig. 19)

In order to communicate with the handset during manufacture and servicing (using a PC) a serial data link has been provided. Serial data input/output is provided on J102 (TP151), and a

ground is provided on J103. The bi-directional serial data line is split into two at IC101 pin 27 (input) and pin 26 (output). Data rate is 9600 baud J103. D105provides ESD protection, and R117 and C146 provide RF de-coupling.

8.2.8. BUZZER CIRCUIT (SEE Fig. 19)

A square-wave signal from IC101 pin 41 (TP103) is used to sound the buzzer via switching transistor T101 (TP101). Various tones and cadences are used dependent on function. Buzzer volume is varied by changing the duty cycle of the drive waveform. D101 provides quenching of back-emf generated when T101 turns off.

8.2.9. OFF HOOK AND CALLER LED´S (SEE Fig. 19)

When the Handset is in "Talk" mode, the Off-Hook LED D102 is switched on by transistor T102 (on), using a control line from pin 28 of IC101 (TP106). "On the TCD952 the caller" LED is switched via T103.

8.2.10. AUDIO PATH-RX AUDIO-LINE INPUT (SEE Fig. 20)

Audio from the Line Interface TXAF (TP123) enters the BBIC on pin 58. R111 and C113 are to balance the line input amplifier, into the ADC part of the codec, where it is sampled and turned into digital data. The burst mode controller then processes this raw data (called the B-field) performing encryption and scrambling, adding the various other fields that go together to produce the GAP standard DECT frame, assigning to a time slot and channel etc. The data then passes through the gaussian filter to emerge on pin 22 as TRADAT, (TP132).

8.2.11. AUDIO PATH - TX AUDIO - LINE OUTPUT (SEE Fig. 20)

Audio from the receiver RECDAT enters the BBIC on pin 20 and passes through the clock recovery circuit. The burst mode controller separates out the B-field data, and performs de-encryption and de-scrambling as required. It then goes to the DAC part of the codec where data is turned back into analogue audio. The audio signal is amplified by the gain-controlled line output amplifier, and balanced audio is output on pin 63, and fed as RXAF (TP120) to the Line Interface.

Circuit Diagram

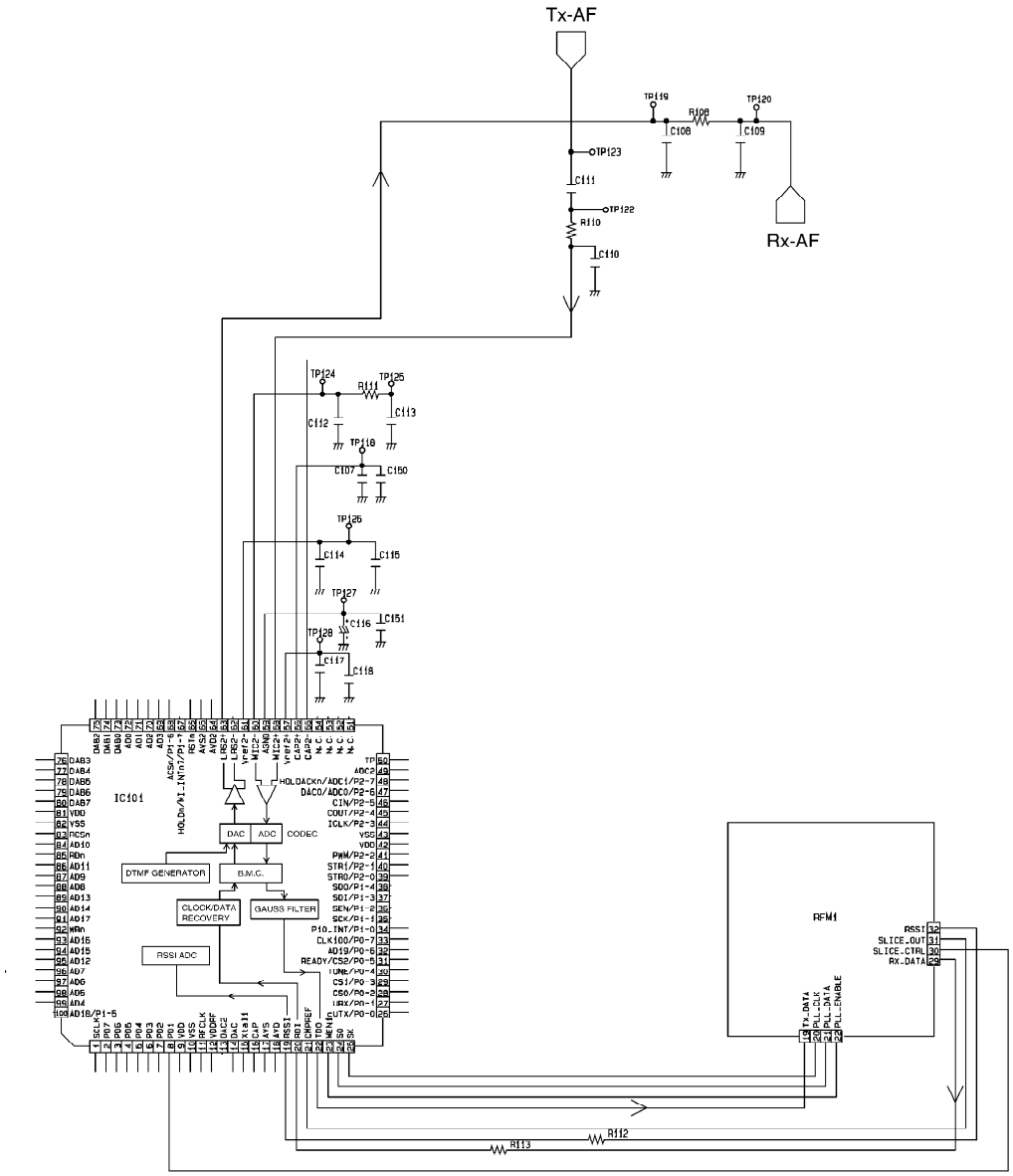


Fig. 20

8.3. THE LINE INTERFACE SECTION (SEE BLOCK DIAGRAM Fig. 19)

8.3.1. INTRODUCTION

This section consists of the telephone line interface, bell detector, hookswitch, pulse dialing circuits, audio circuits, DC mask & line impedance circuits, power supplies, and battery charger circuits.

8.3.2. TELEPHONE LINE INTERFACE (SEE Fig. 21)

The telephone line is connected (via 2 or 3 jumpers selected for country of destination) to a bridge rectifier D8. Surge suppressor SA3 protects against excessive line voltages. Test points are TP14 (A), TP13 (B), TP21 (S) and TP15 (E). Bridge rectifier D8 provides for lines of either polarity. The output of D8 is “Line +” (TP50) and “Line -” which is ground.

8.3.3. EARTH RECALL (SEE Fig. 21)

For countries that require Earth Recall facilities, relay RLY1 is provided to short the E line to the

A or B lines. The relay is energised when transistor T2 is switched on by a high level on the EARTH control line (TP77) from the BB-IC IC101. D1 will quench the large back-emf voltage that would otherwise occur across the relay coil when T2 turns off.

8.3.4. BELL DETECTOR (SEE Fig. 21)

The AC ringing signal is detected by optocoupler IC2, using its internal diode in conjunction with D4. DC from the line is blocked by the wall plug inside. The other components D2, D3, and R3 reduce current and increase the circuit impedance in line with national requirements. When ringing is detected IC2 will turn on, and the RING line (TP76) will be dragged to a low voltage.

Circuit Diagram

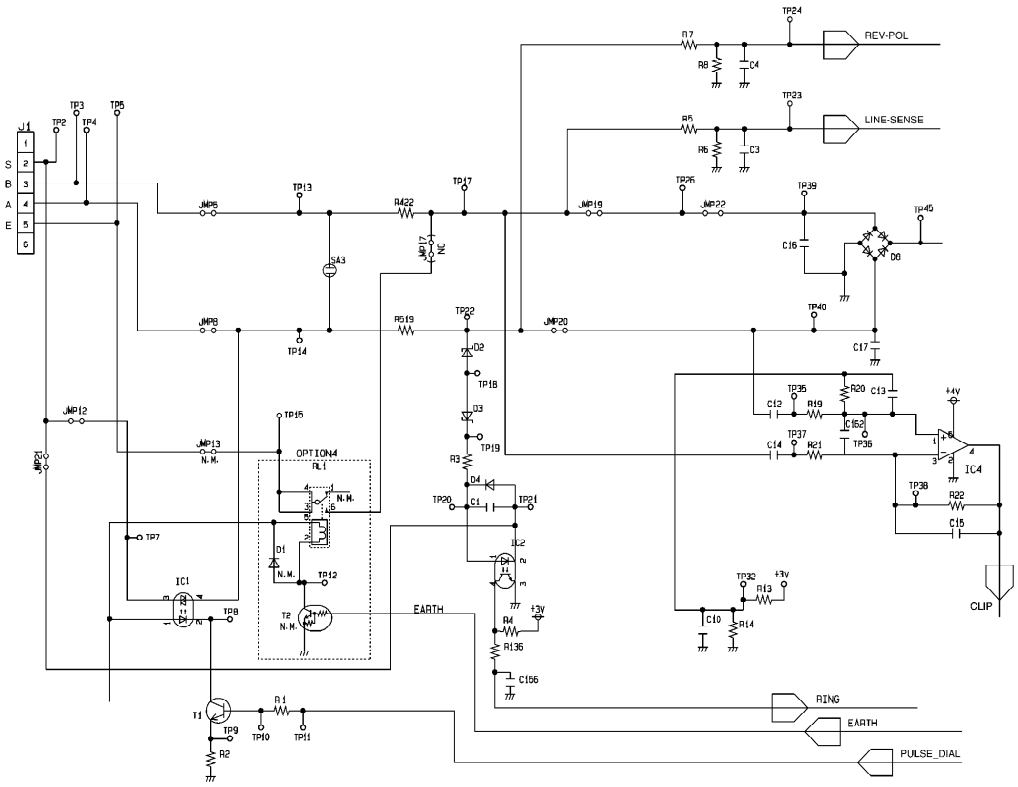


Fig. 21

8.3.5. CLIP CIRCUITS (SEE Fig. 21)

The caller ID signal is detected by IC4.

8.3.6. HOOKSWITCH (AND PULSE DIALING) (SEE Fig. 22)

T8 is the hookswitch, driven by T9. When the phone is “off-hook”, the HOOK control signal from the BBIC will be a high logic level (+3V), and all both transistors will be on, thus T8 will “loop” the line. The zenner diode D10 protects transistors T11 to T13 against transient line voltages.

8.3.7. PULSE DIALING (SEE Fig. 22)

During pulse dialing the hookswitch (T8, T9) is used to generate the pulses using the HOOK control signal, which is set high during pulses. To force the line impedance low during the “pause” intervals between dial pulses, the PAUSE-DIAL signal turns on T11, which turns on T12 harder (increases current), thus reducing line impedance (see 8.3.10. BATTERY CHARGER)

8.3.8. AUDIO CIRCUITS (SEE Fig. 22)

The line output signal from the BBIC RXAF (TP120) is amplified by T13. The RXAF line is DC coupled to T13 thus making it work as a current limiter (typically < 8mA). The emitter load of T13

is complex to achieved the correct frequency response, since the line load (for UK) is also complex. The line input signal TXAF (TP123) is taken from the junction of R41 and R70. Phase cancellation of the line output audio occurs at this point, so that only incoming line audio should be passed to the BBIC on TXAF.

Circuit Diagram

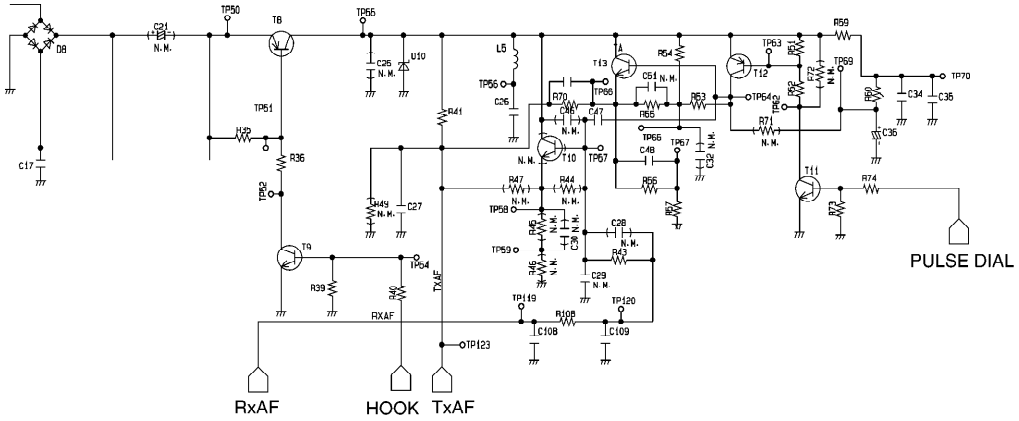


Fig. 22

8.3.9. POWER SUPPLIES (SEE Fig. 23)

The AC Adaptor for the KX-TCD952NLB consists of two separate isolated DC supplies providing a +8 V supply for the base circuitry, and a 9 V supply only for the charger circuit. The isolation is because the main base circuitry is connected to the telephone line, so potentially hazardous voltages may be present, while the charger circuitry has charge contacts that could be touched by the operator, so the two supplies must be kept separate. The 8 V supply from the AC Adaptor is connected via J2 pin 1 (TP90) +8 V, and J2 pin 2 (TP89) ground. The unregulated +8 V supply is fed to the first regulator.This regulator IC7 provides a regulated output pin 2 (TP91) of +4.0 V (called +4V). The second regulator IC6 is fed with +4V and provides the stable +3.0V supply (TP95). During power-up this regulator generates a RESET signal (TP94) which is used to reset the microcontroller and BBIC.

8.3.10. BATTERY CHARGER (SEE Fig. 23)

The 9 V supply from the AC Adaptor is connected via J2 pin 6 (TP82) positive, and J2 pin 5 (TP78) negative. Theconstant current battery charger circuit is made up of T14 and T15 (series pass transistor) and associatedcomponents. Charging detector circuit T16 switches on when a charging current flows through R64 and D11, and turns on the “Charging” LED D12. The charge contacts are J3 (TP89) positive and J4 (TP88) negative.Charge current flows in via J4, through T15, R63, AC Adaptor 9 V supply, R64, D11, and out via J3.

Circuit Diagram

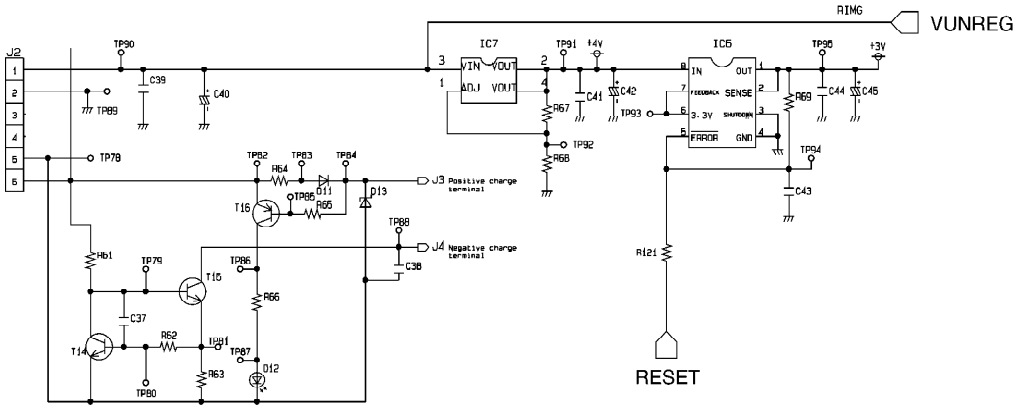


Fig. 23

9. BLOCK DIAGRAM RF UNIT (HANDSET)

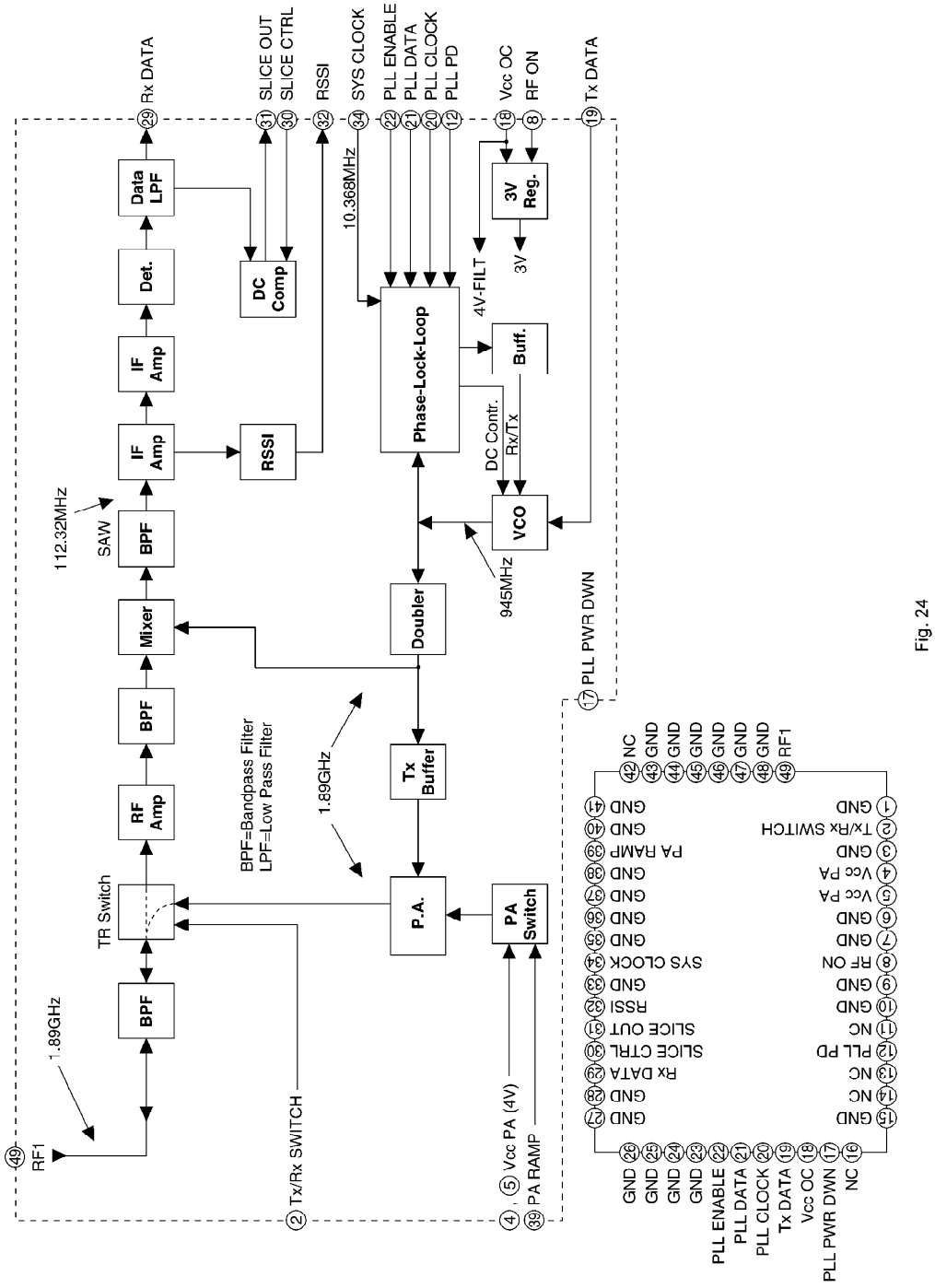


Fig. 24

10. BLOCK DIAGRAM BASE-BAND SECTION (HANDSET)

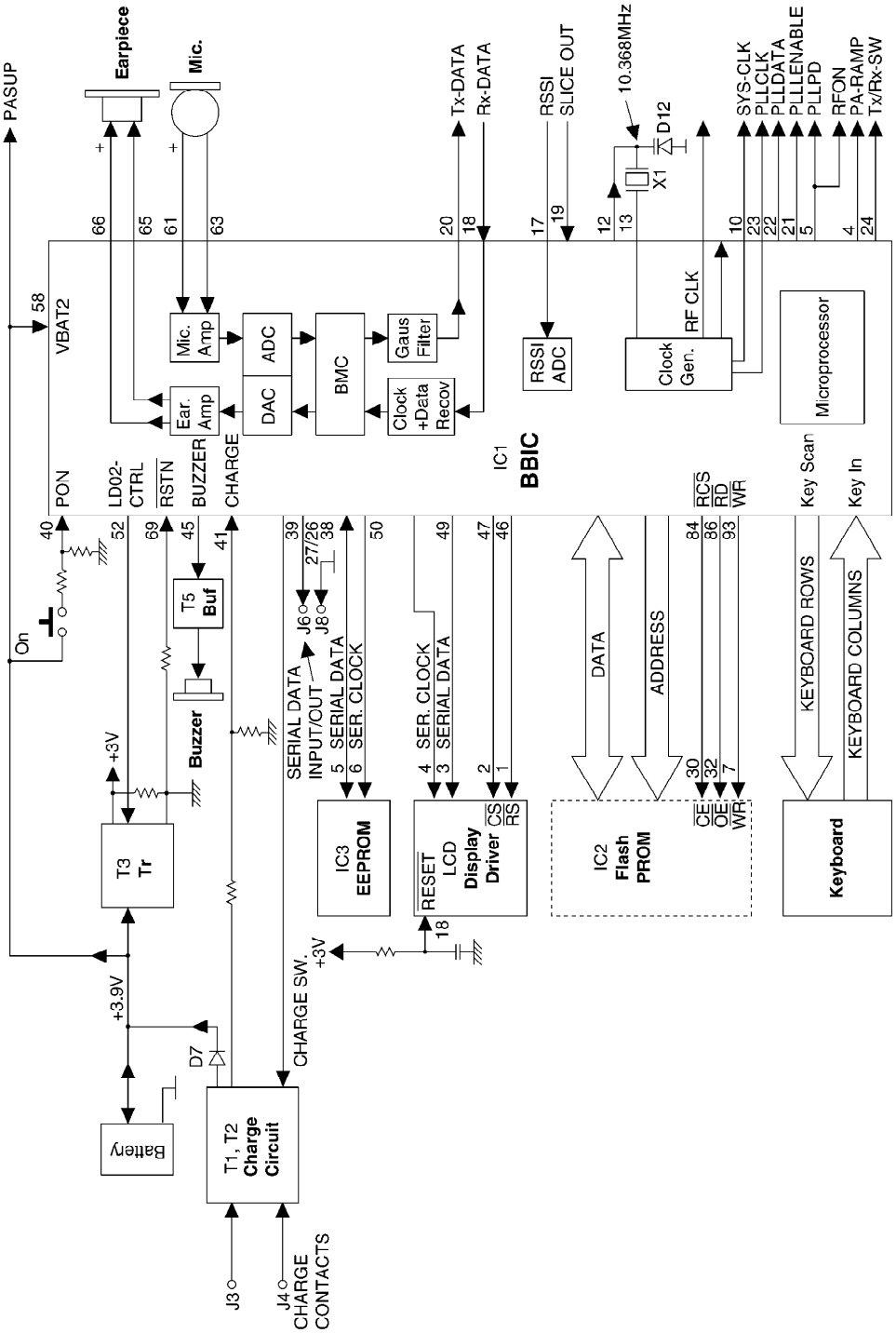


Fig. 25

11. CIRCUIT OPERATION (HANDSET)

11.1. THE BASE-BAND SECTION (SEE BLOCK DIAGRAM Fig. 25)

11.1.1. INTRODUCTION

The base-band section consists of a base-band integrated circuit (BBIC), a Flash PROM, an EEPROM, an LCD Display, a Microphone, an Earpiece, and power supply/battery management circuits.

11.1.2. THE BASE-BAND INTEGRATED CIRCUIT (BBIC)

The National SC14405 BBIC (IC1) is a CMOS device designed to handle all the audio, signal and data processing needed in a DECT handset. It contains two microprocessors - one general purpose - while the other ìburst mode controllerî takes care of DECT specific physical layer and radio section control.The BBIC also contains the ADPCM transcoders, a low power 14 bit codec (ADC/DAC), various other ADCís, DACís and timers, a UART for data communication with RF unit, a gaussian filter for the DECT GFSK modulation method, clock and data recovery circuits, a clock oscillator circuit, a battery management circuit, and a pair of gaincontrollable amplifiers for the microphone and earpiece.

11.1.3. LCD DISPLAY, AND DISPLAY DRIVER (SEE Fig. 26)

The LCD display also receives data via a serial interface. Serial data is sent to LCD display on pin 3 (TP70). The RS signal (pin 1, TP67) is used by the BBIC to send either commands or data.

Circuit Diagram

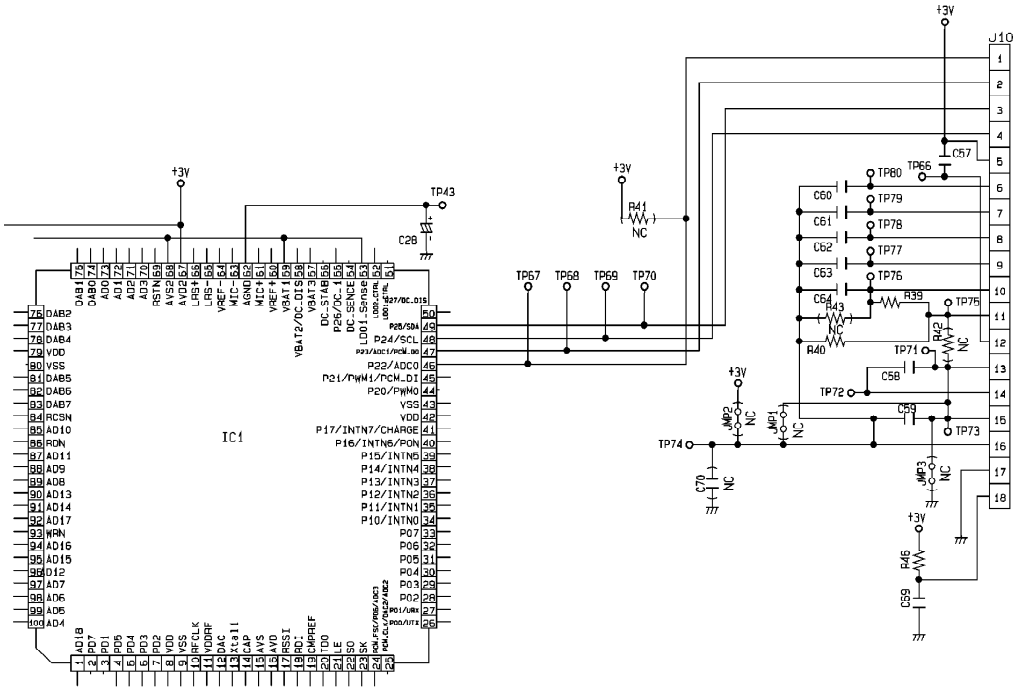


Fig. 26

11.1.4. AUDIO PATH - TX AUDIO (SEE Fig. 27)

Balanced audio from the microphone (TP40 and TP41) enters the BBIC at pins 61 and 63. A balanced bias voltage for the (“electret” type) microphone is supplied by the BBIC from pins 60 and 64 via R31 and R32. This supply is de-coupled by R22, R27, C21, C28, and C22. RF de-coupling of the microphone signal is provided by R27, C25, R28, C26, R24, R25, and C20. The microphone audio signals are coupled to the BBIC via C22 and C23, which provide some high pass filtering. / In the BBIC audio passes through the gain-controlled microphone amplifier, into the ADC part of the codec, where it is sampled and turned into digital data. The burst mode controller then processes this raw data (called the B-field) performing encryption and scrambling, adding the various other fields that go together to produce the GAP standard DECT frame, assigning to a time slot and channel etc. The data then passes through the gaussian filter to emerge on pin 20 as TRADAT.

11.1.5. AUDIO PATH - RX AUDIO (SEE Fig. 27)

Audio from the receiver RECDAT (TP54) enters the BBIC on pin 18 and passes through the clock recovery circuit. The burst mode controller separates out the B-field data, and performs de -encryption and de-scrambling as required. It then goes to the DAC part of the codec where data is turned back into analogue audio. The audio signal is amplified by the gain-controlled earpiece amplifier, and balanced audio is output on pins 65 and 66, and fed to the earpiece (TP31 and TP32). The leads feeding the earpiece are RF de-coupled by C15 to R22, C17, C16, R23, and C18. C19 provides low pass filtering.

Circuit Diagram

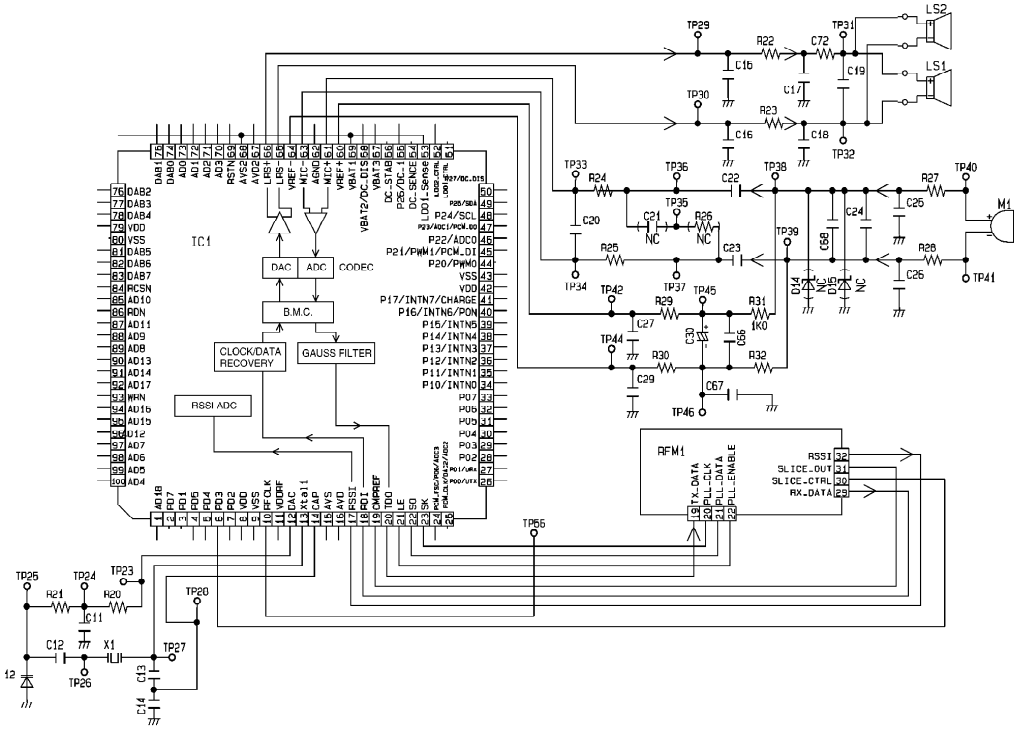


Fig. 27

11.1.6. CLOCK GENERATION (SEE Fig. 28)

A single clock generator in the BBIC uses an external crystal X1 to derive all clock frequencies used in the handset. The crystal is tuned to the exact frequency of 10.368 MHz during manufacture by feeding a DC voltage from an internal DAC (from pin 12) to the varicap diode D12 (TP25). The RFCLK output (pin 10, TP56) is a buffered clock signal at 10.368 MHz for the Frequency Synthesizer, that is only active during the PLL lock period (see section 1.3). The basic data rate for TX-DATA and RX-DATA is 1.152 Mbits/s, which is divided by 9. The data rate for the serial interface to the phase-lock-loop is also 1.152 Mbits/s.

11.1.7. KEYBOARD (SEE Fig. 28)

The keyboard "On" button is connected directly to pin 41 of the BBIC (TP10). When pressed it turns the handset on and off (must be held for off). All other keys are connected in a row/ column matrix. They are scanned in six rows using scan pulses (only active when keys are pressed) from IC1 pins 28 to 33. The four key matrix columns are input to the BBIC on pins 31 to 34.

Circuit Diagram

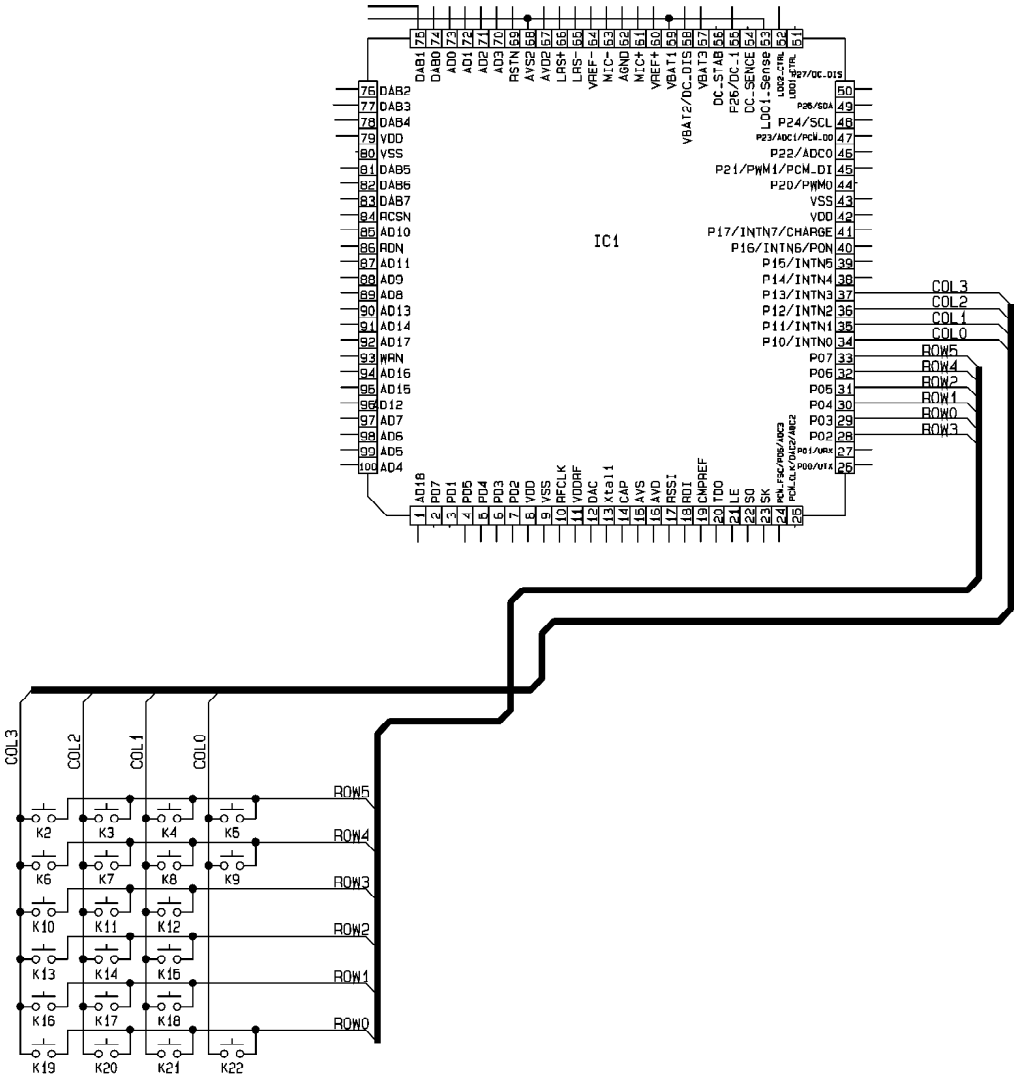


Fig. 28

11.1.8. FACTORY SERIAL PORT (SEE Fig. 25)

In order to communicate with the handset during manufacture and servicing (using a PC) a serial data link has been provided. Serial data input/output is provided on J6 (TP65), and a ground is provided on J7. The bi-directional serial data line is split into two at IC1 pin 27 (input) and pin 26 (output). Data rate is 9600 baud or 115.2 kBaud. D13 provides ESD protection, and R37 and C56 provide RF de-coupling.

11.1.9. BUZZER CIRCUIT (SEE Fig. 29)

A square-wave signal from IC1 pin 45 is used to sound the buzzer via switching transistor T5 (TP22). Various tones and cadences are used dependent on function. Buzzer volume is varied by changing the duty cycle of the drive waveform. D11 provides quenching of back-emf generated when T5 turns off.

11.1.10. BATTERY SUPPLY (SEE Fig. 29)

The three cell NiCd/NiMH rechargeable battery supplies the handset via 2A fuse (actually a coil), and is de-coupled by C3 and C4. It directly supplies T3 in the baseband section, and also the Tx PA in the RF Section. It also supplies IC1 (de-coupled by C9), and most of the RF Section (VCC-OC) (decupled by R35 and C47, C48 and VCC-PA).

11.1.11. MAIN 3V REGULATOR (SEE Fig. 29)

The BBIC measures the battery voltage on pins 58 using an internal ADC. If the battery voltage is below 3.36 V, TC3 is switched to power off mode. R7 and C5 provide a reset pulse (TP84) used for resetting the BBIC when power on. The +3 V supply (TP10) is fed to the BBIC, Flash PROM, EEPROM, and Display Driver.

11.1.12. BATTERY CHARGING CIRCUIT (SEE Fig. 29)

The charge circuit is designed to operate with a constant current charger in the base. L1, L2, D2 and D4 protect against electro-static discharge (ESD). The charging current from the base is turned on and off by T1 using a control signal from the BBIC (pin 39, TP6) via T2. R3 provides initial current in the event of a totally flat battery, and D6 protects against the high voltage present on the charge contacts if there is no battery in the handset. R4 and R5 provide a signal for the BBIC to detect (pin 40) that the handset had been placed on the base charger. If the handset is off, it will be switched on, and charging will start.

Circuit Diagram

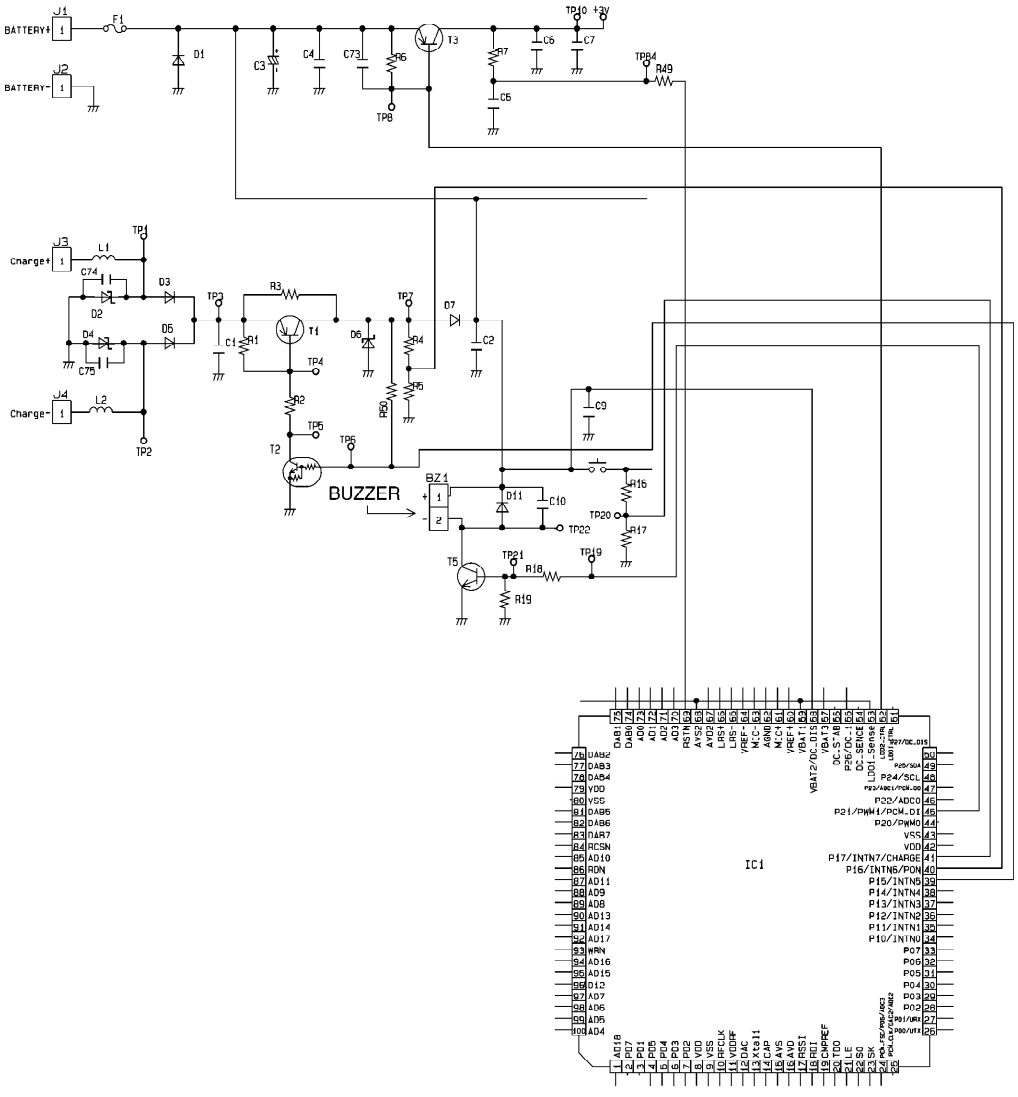


Fig. 29

12. ADJUSTMENT (BASE UNIT)

Adjustment objectives

Adjustment item	Symptom	Remedy
Clock frequency	Synchronization with the portable handset is lost immediately. No link is established.	Perform the adjustments described in item(1).

Tools required for adjustments

- Frequency counter
- Personal computer
- Serial communication tool
- Test software (batch files)
- Line simulator
- Oscillator
- Audio level meter

Item(1)

1. Connect the serial link to test computer to J102 (serial data) and J103 (GND).
2. Connect the AC adaptor.
3. Connect the frequency counter to TP148 (SCLK) and J103 (GND).
4. Send batch file “FIXFREQ.BAT”
5. Send “SETFREQ.BAT” to set the clock frequency. The default value is 80. Increase the value to increase the frequency. The clock frequency must be 3,456 kHz ± 0.007 kHz.

13. ADJUSTMENT (HANDSET)

Adjustment objectives

Adjustment item	Symptom	Remedy
Clock frequency	Synchronization with the portable handset is lost immediately. No link is established.	Perform the adjustments described in item(1).
Low battery	The communication (standby) times is short. The low battery display period is too long or too short.	Perform the adjustments described in item(2).

Tools required for adjustments

- **Frequency counter**
- **Power supply unit (DC 3V~5V, 1A)**
- **Personal computer**
- **Serial communication tool**
- **Test software (batch files)**

Item(1)

1. **Connect the serial link to test computer to J6 (serial data) and J8 (GND).**
2. **Turn off power for the base unit.**
3. **Input a 3.9V supply to the handset J5 (+) and J8 (GND).**
4. **Connect the frequency counter to TP56 and J8 (GND).**
5. **Press the “power on” button.**
6. **Send batch file “FIXFREQ.BAT”.**
7. **Use batch file “SETFREQ.BAT” to set the clock frequency. The default value is 80. Increase the value to increase the frequency and vice-versa. The clock frequency must be 10,368.000 kHz ± 0.02 kHz.**

Item(2)

1. **Connect the serial link to test computer for J6 (serial data) and J8 (GND).**
2. **Set the battery voltage to 4.6V at J1 and J2.**
3. **Press the “power on” button.**
4. **Send batch file “READBATT.BAT”. The returned hex value is M2.**
5. **Send batch file “WRTBATT.BAT M2”.**
6. **Set the battery voltage to 3.5V at J5 (+).**
7. **Send batch file “READBATT.BAT”. The returned hex value is M1.**

8. Send batch file “WRTBATT.BAT M1”.

9. Calculate the low value 2 level:

$$M3\ Dec = \frac{M1\ Dec - (M2\ Dec - M1\ Dec) \times 0.1}{4.6 - 3.5}$$

10. Send “WRTBATT.BAT M3”.

14. CHECK PROCEDURE (BASE UNIT)

14.1. TEST EQUIPMENT REQUIRED AND EQUIPMENT SETUP

(a) CMD60

TEST MODE:	FP		
CONFIG MENU	SIGN	SCRAMBLE:	OFF
MANUAL TEST	TRAFFIC SLOT :	2	
	TRAFFIC CARRIER:	5	
	RF LEVEL:	– 55 dBm	
MODULE TEST	TRIGGER:	RISING SLOPE	
	EXP. POWER:	30 dBm	
MODULE TEST	RF GENERA TOR	FREQ:	1888.704 MHz
		DEVIA TION:	288 kHz
		SIGNAL:	01010101
		RF LEVEL:	– 65 dBm

(b) “Bell” Oscillator: FREQUENCY : 25Hz

(c) Power Supply (10V 1A)

(d) DMM

(e) Ammeter

(f) Frequency Counter

(g) Oscilloscope

(h) Computer (PC): Set the computer to the MS-DOS mode. Type: SET_COM1.

(i) Test sof tware (Batch Files)

Connect an 10V supply to the board J2 pin 1 (+), pin 2 (–), (or connect an AC Adaptor).

Connect the computer serial link to the Test Fixture J102 (+), J103 (–).

14.2. INITIAL POWER + BBIC TESTS

1. Turn on the 10V supply.

2. Check for approx. 70 mA current on the 10V supply.

3. Check the 4V supply voltage (TP91). It must be 3.88 ±0.2V.

4. Check the 3.3V supply voltage (TP95). It must be 3.0 ±0.2V.

5. Connect SCLK (TP148) to CH.1 on the scope.

6. Check if the clock waveform is 3,456 kHz.

7. Send batch file “SELF TEST”.

14.3. SET THE CLOCK FREQUENCY

1. Send batch file “FIX FREQ”.

2. Check for approx. 90 mA current on the 8V supply.

3. Transfer SCLK (TP148) to the frequency counter.
4. Send batch file “SETFREQ nn” to set the clock frequency. The default value of nn is 80. Increase the value to increase the frequency and vice-versa. The clock frequency must be 3,456 kHz (± 0.007 kHz).

14.4. QUICK Tx CHECK

1. Set the CMD60 to MODULE TEST.
2. Send batch file “H”.
3. Confidence check of Power (NTP): it must be +20 to +25 dBm.
4. Confidence check of Frequency Offset: it must be 0 ± 40 kHz.
5. Confidence check of Deviation of B field Data Type 01010101: it must be 207 to 270 kHz.

14.5. LOOPBACK TEST

1. Set the CMD60 to MANUAL TEST.
2. Set the CMD60 TRAFFIC CARRIER to 5.
3. Send batch file “TESTMODE”.
4. On the CMD60, press “SETUP CONNECT”.
5. Check the Power (NTP): It must be +20 to +25 dBm.
6. Press MODULATION.
7. Set Data Type to “Fig.31”.
8. Check the Frequency Drift: it must be 0 ± 45 kHz/ms.
9. Check the Frequency Offset: it must be 0 ± 40 kHz.
10. Send batch file ìWREE 00 16 nmî to adjust the Deviation (Max. B Field) with Data Type: 01010101. Increase the value nm to increase the Deviation and vice-versa. The least significant digit (m) of the value must be 1 (i.e. only the values 31, 41, 51, 61 etc. are allowed). The Deviation must be 207 to 270 kHz.
11. Check the Deviation (Max. ± B Field) with Data Type “Fig.31”: it must be 202 to 404 kHz.
12. Press MENU UP.

13. Press POWER RAMP.
14. Check the Burst fits mask.
15. Press MENU UP.
16. Press BER.
17. Note the Sensitivity (reduce RF LEVEL for a BER of approx. 1000ppm) : the RF LEVEL must be < - 90 dBm.
18. Press MENU UP.
19. Press BEARER RELEASE.

Note:

These tests can be repeated on Traffic Carriers 5 and 9.

14.6. TELEPHONE LINE TESTS

1. Connect the tel line from the base under test to the line simulator.
2. Send batch file “OFFHOOK”.
3. Check if the green “In-Use” LED is on.
4. Set the line current to 40 mA on the line simulator.
5. Send batch file “ONHOOK”.
6. Check that the line current is 0 ± 0.5 mA.
7. Check if the green “In-Use” LED is off.
8. Send batch file “OFFHOOK”.
9. Check the DC Voltage on TP45. It must be 9.5 ± 0.5V.
10. Send batch file “LINIMP 1”.
11. Check the DC Voltage on TP45. It must be < 3.5V.
12. Send batch file “LINIMP 0”.
13. Send batch file “PULDIAL”.
14. Observe on the line simulator current meter that 5 dial pulses are output causing the current to reduce to approx. 20mA.
15. Send batch file “STRTDTMF”.
16. Check on the scope that a DTMF waveform is output on that tel line.

17. Send batch file “STOPDTMF”.
18. Disconnect the tel line from the base under test to the line simulator.nm
19. Connect the “Bell” Oscillator to the tel line.
20. Set the “Bell” Oscillator voltage to 32V RMS 23Hz.
21. Send batch file “RINGDET”.
22. Check that the ringing voltage has been detected (1 = detected).

14.7. CHARGE CURRENT TEST

1. Connect the 11V supply to J2 pin 6 (+) and J2 pin 5 (-).
2. Connect the ammeter with a series load resistor of 56 Ω /2 W to J3 (+) and J4 (-).
3. Switch on the 11V supply.
4. Check the Charge Voltage to J3 and J4 9.5 ± 0.5 V.
5. Switch off the 11V supply.
6. Connect the 11V supply to the “11V Supply” sockets on the test jig.

15. CHECK PROCEDURE (HANDSET)

15.1. TEST EQUIPMENT REQUIRED AND EQUIPMENT SETUP

(a) CMD60

TEST MODE:	PP		
MANUAL TEST	RFPI:	0000000010	
	DUMMY SLOT:	0	
	DUMMY CARRIER:	5	
	TRAFFIC SLOT:	2	
	TRAFFIC CARRIER:	5	
	RF LEVEL:	– 55 dBm	
MODULE TEST	TRIGGER:	RISING SLOPE	
	EXP. POWER:	30 dBm	
CONFIG MENU	SIGN	SCRAMBLE:	OFF
MODULE TEST	RF GENERATOR	FREQ:	1888.704 MHz
		DEVIATION:	288 kHz
		SIGNAL:	00001111
		RF LEVEL:	– 40.7 dBm

(b) Power Supply (12V 1A)
(c) Digital MultiMeter
(d) Oscilloscope
(e) Frequency Counter
(f) Computer (PC): Set the computer to the MS-DOS mode. Type: SET-COM1.
(g) Test software (Batch Files)

Connect a 3.9V supply to the board J5 (+), J8 (–).
Connect the computer serial link to the Test Fixture J6 (+), J8 (–).

15.2. INITIAL POWER + BBIC TESTS

1. **Turn on the 3.9V supply.**
2. **Press the “Power-on” button.**
3. **Check for a “beep” and approx 80 mA current on the 3.9V supply.**
4. **Check the 3.0V supply voltage (TP10). It must be 2.85 +/- 0.3.**
5. **Connect RFCLK (TP56) to CH.1 on the scope. Send batch file RFCLK1.**
6. **Check if the clock waveform is 10,368.000 kHz, +/- 40Hz.**
7. **Send batch file ”SELF TEST”. The first 4 digits are FLASH ROM checksum, the next 2 digits are RAM test, and must be 00.**

15.3. SET CLOCK FREQUENCY

1. **Send batch file “RFCLK1”.**
2. **Connect RFCLK (TP56) to the frequency counter.**
3. **Send batch file “SET FREQ nn” to set the clock frequency. The default value of nn is 80. Increase the value to increase the frequency. The clock frequency must be 10,368.000 kHz ± 0.04 kHz.**

15.4. QUICK Tx CHECK

1. **Set the CMD60 to MODULE TEST.**

2. Send batch file “H”.
3. Confidence check of Power (NTP): must be +20 to +25 dBm.
4. Confidence check of Frequency Offset: must be 0 ± 40 kHz.
5. Confidence check of Deviation of B field Data Type 01010101: must be 207 to 270 kHz.

15.5. LOOPBACK TEST

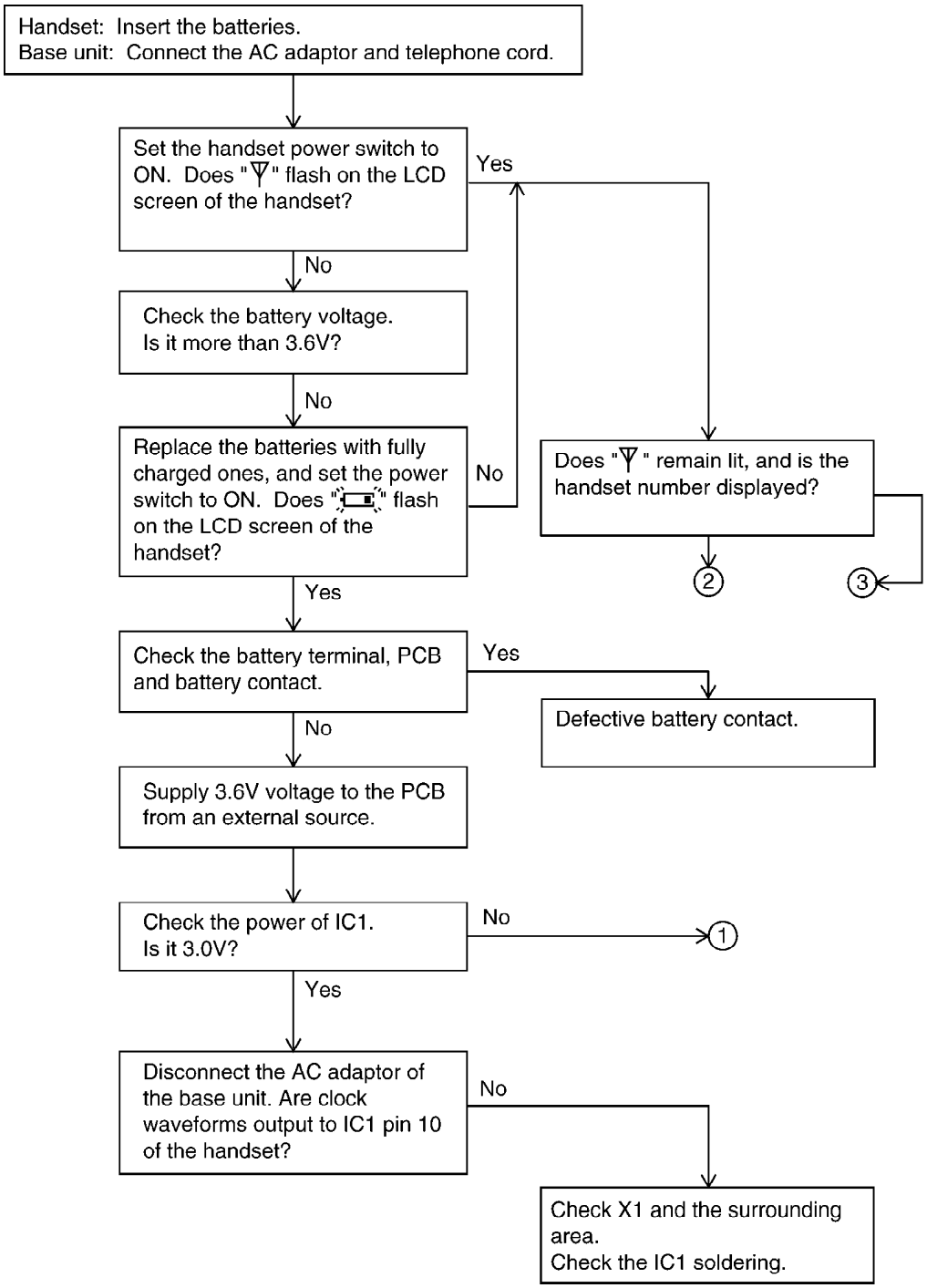
1. Set the CMD60 to MANUAL TEST.
2. Set the CMD60 TRAFFIC CARRIER to 5.
3. Send batch file “TESTMODE”.
4. On the CMD60 press “SETUP CONNECT”.
5. Check Power (NTP): must be +20 to +25 dBm.
6. Press MODULATION.
7. Set Data Type to “Fig.31”.
8. Check the Frequency Drift: must be 0 ± 45 kHz/ms.
9. Check the Frequency Offset: must be 0 ± 40 kHz.
10. Send batch file ìWREE 00 16 nmî to adjust the Deviation (Max. B Field) with Data Type: 01010101. Increase the value nm to increase the Deviation and vice-versa. The least significant digit (m) of the value must be 1 (i.e. only the values 31, 41, 51, 61 etc. are allowed). The Deviation must be 207 to 270 kHz
11. Check the Deviation (Max. ± B Field) with Data Type “Fig.31”: must be 201 to 404 kHz.
12. Press MENU UP.
13. Press POWER RAMP
14. Check the Burst fits mask.
15. Press MENU UP.
16. Press BER.
17. Note the Sensitivity (reduce the RF LEVEL for a BER of approx. 1000ppm) : RF LEVEL must be < - 90 dBm
18. Press MENU UP.

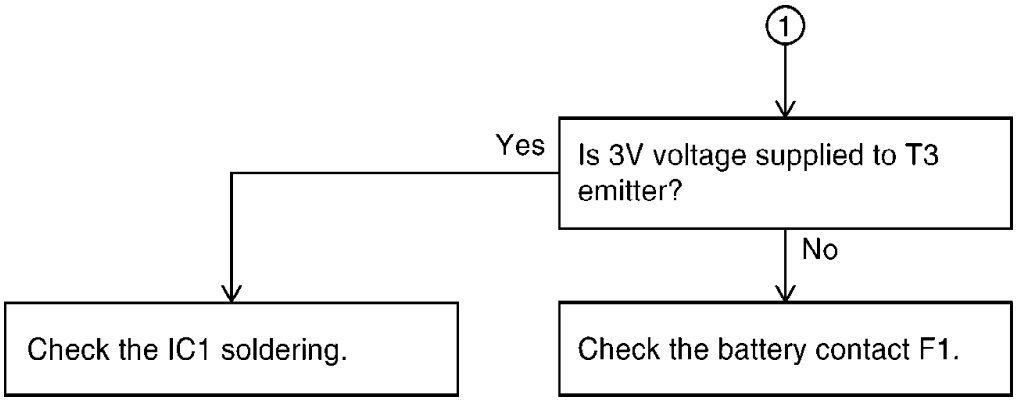
19. Press BEARER RELEASE.

Note:
These tests can be repeated on Traffic Carriers 0 and 9.

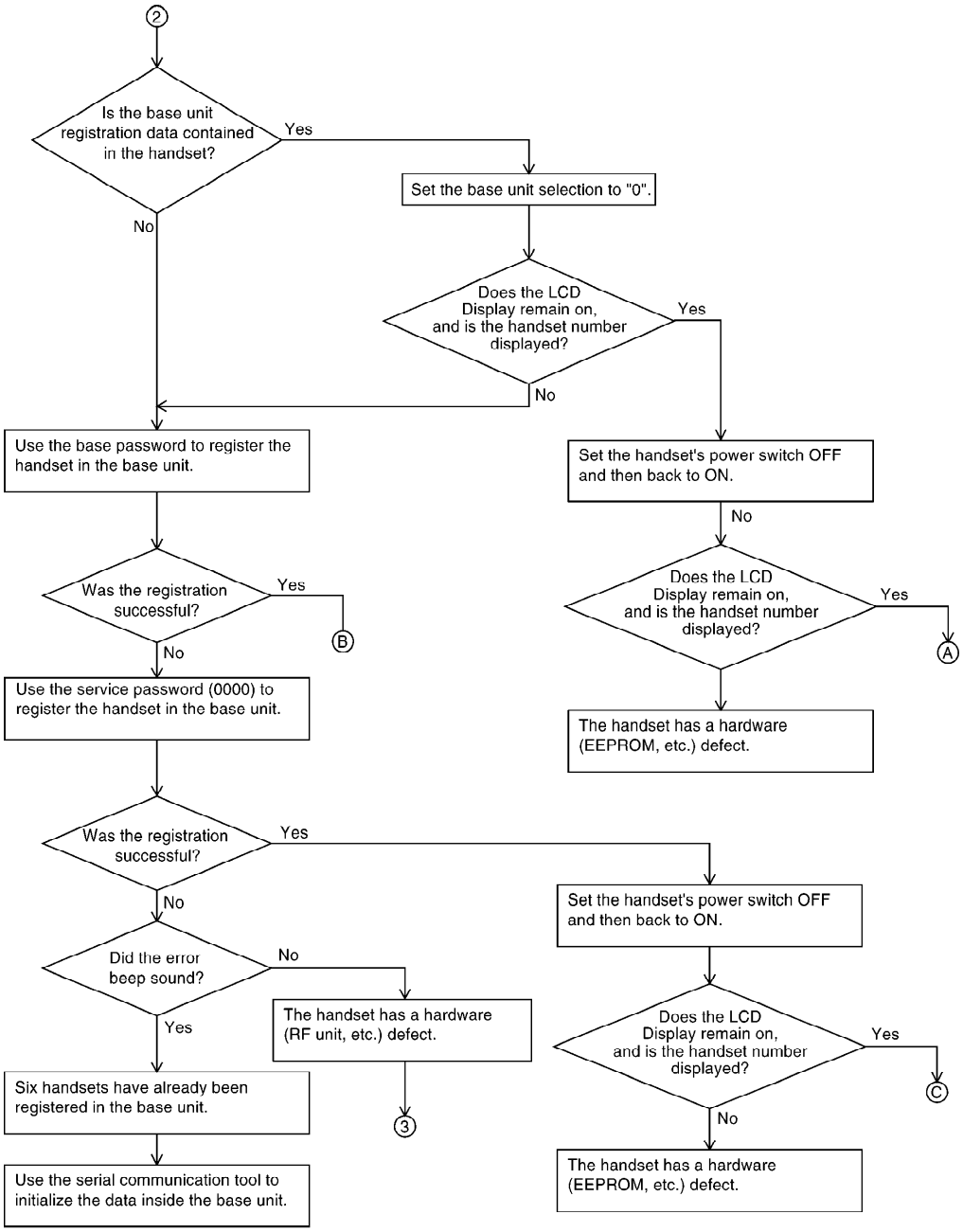
16. TROUBLESHOOTING GUIDE

16.1. HANDSET: DOES NOT OPERATE

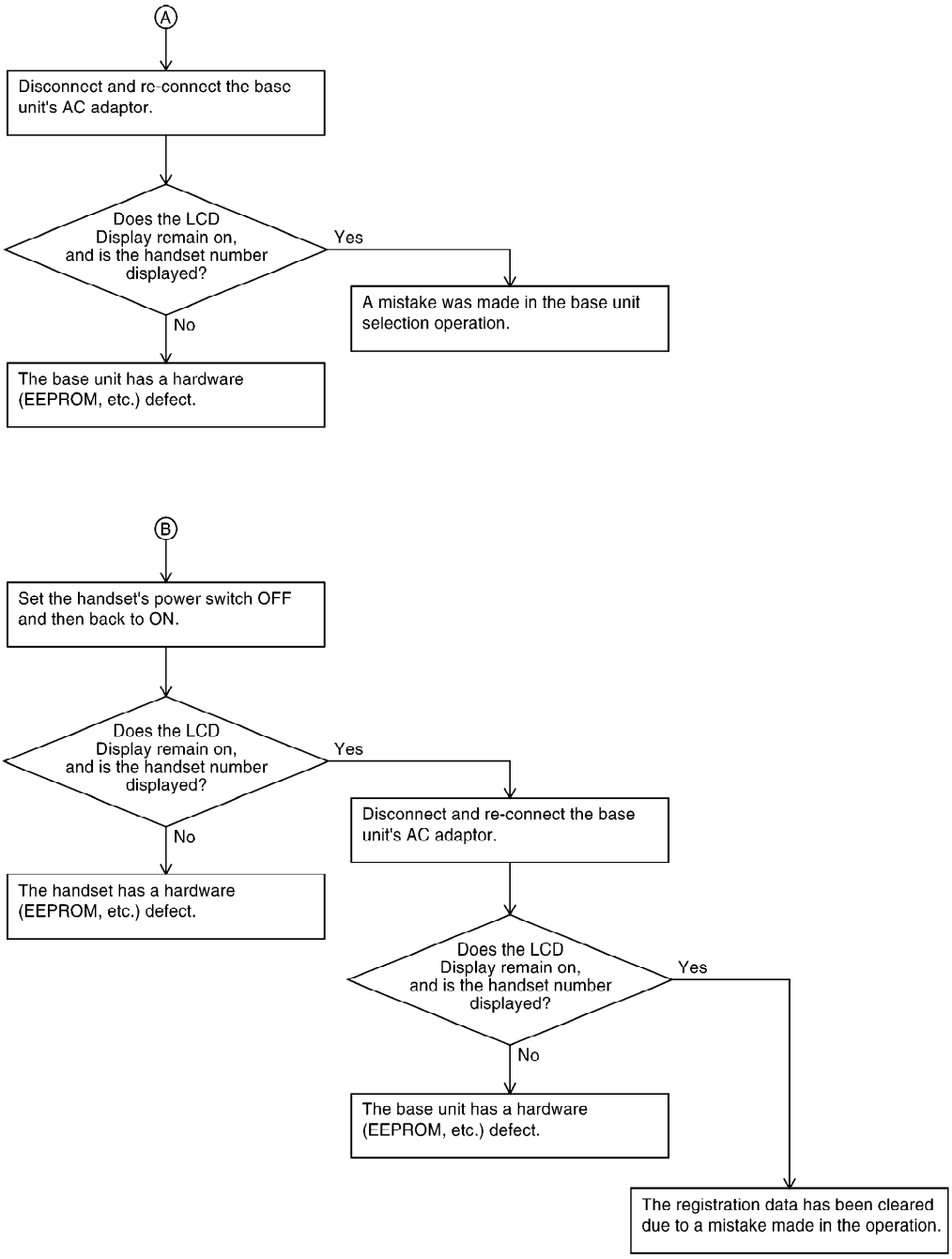

Handset: Insert the batteries.
Base unit: Connect the AC adaptor and telephone cord.
Set the handset power switch to ON. Does "" flash on the LCD screen of the handset?
Yes
No
Check the battery voltage. Is it more than 3.6V?
No
Replace the batteries with fully charged ones, and set the power switch to ON. Does "" flash on the LCD screen of the handset?
No
Does "" remain lit, and is the handset number displayed?
2
3
Yes
Check the battery terminal, PCB and battery contact.
Yes
Defective battery contact.
No
Supply 3.6V voltage to the PCB from an external source.
Check the power of IC1. Is it 3.0V?
No
1
Yes
Disconnect the AC adaptor of the base unit. Are clock waveforms output to IC1 pin 10 of the handset?
No
Check X1 and the surrounding area.
Check the IC1 soldering.

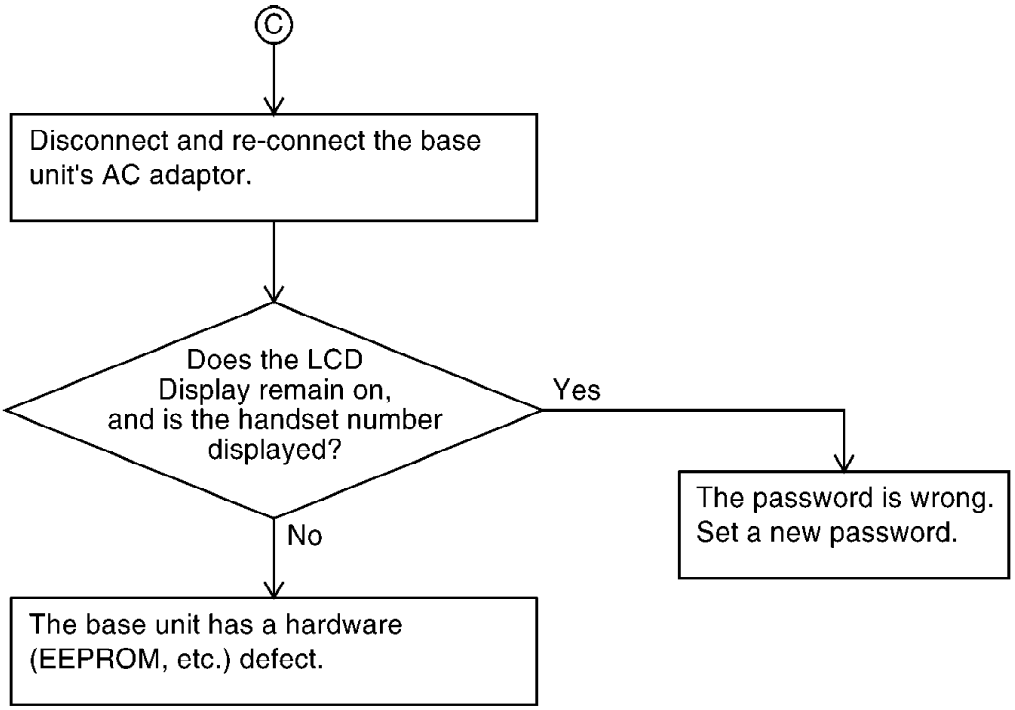


16.2. HANDSET: LINK

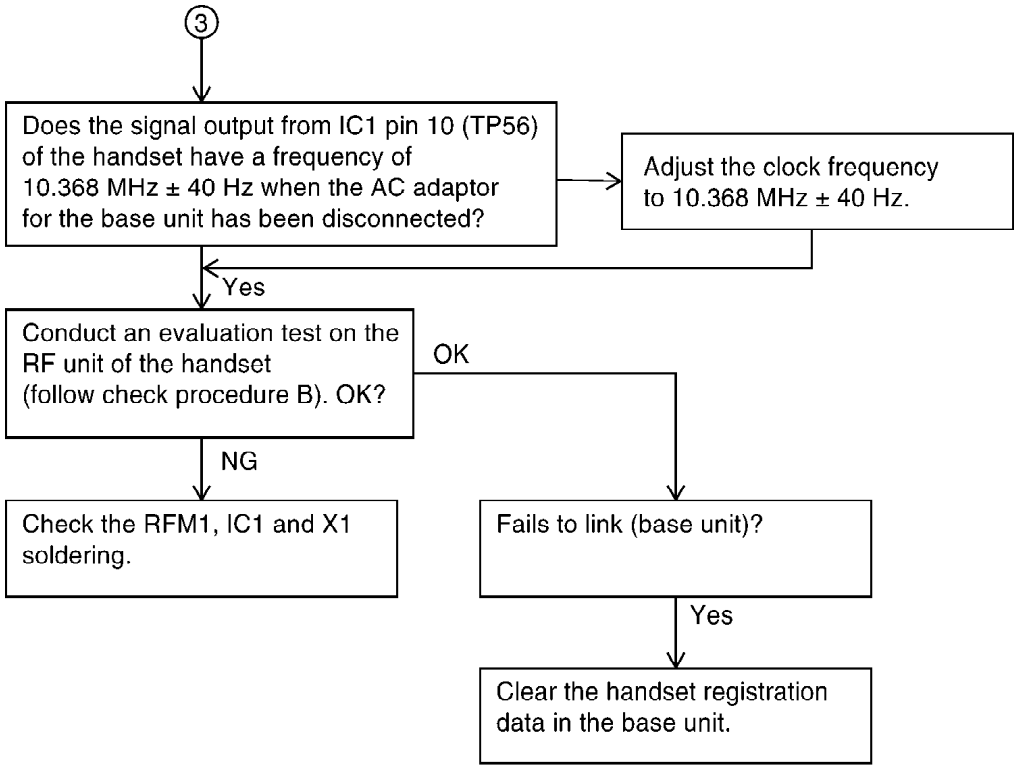

2
Is the base unit registration data contained in the handset?
Yes
No
Set the base unit selection to "0".
Does the LCD Display remain on, and is the handset number displayed?
Yes
No
Use the base password to register the handset in the base unit.
Was the registration successful?
Yes
B
No
Use the service password (0000) to register the handset in the base unit.
Was the registration successful?
Yes
No
Did the error beep sound?
No
Yes
The handset has a hardware (RF unit, etc.) defect.
3
Six handsets have already been registered in the base unit.
Use the serial communication tool to initialize the data inside the base unit.
Set the handset's power switch OFF and then back to ON.
No
Does the LCD Display remain on, and is the handset number displayed?
Yes
A
The handset has a hardware (EEPROM, etc.) defect.
Set the handset's power switch OFF and then back to ON.
Does the LCD Display remain on, and is the handset number displayed?
Yes
C
No
The handset has a hardware (EEPROM, etc.) defect.

(Use the method for clearing the registered handset data in the base unit.)


A
Disconnect and re-connect the base unit's AC adaptor.
Does the LCD Display remain on, and is the handset number displayed?
Yes
A mistake was made in the base unit selection operation.
No
The base unit has a hardware (EEPROM, etc.) defect.
B
Set the handset's power switch OFF and then back to ON.
Does the LCD Display remain on, and is the handset number displayed?
Yes
Disconnect and re-connect the base unit's AC adaptor.
No
The handset has a hardware (EEPROM, etc.) defect.
Does the LCD Display remain on, and is the handset number displayed?
Yes
No
The base unit has a hardware (EEPROM, etc.) defect.
The registration data has been cleared due to a mistake made in the operation.

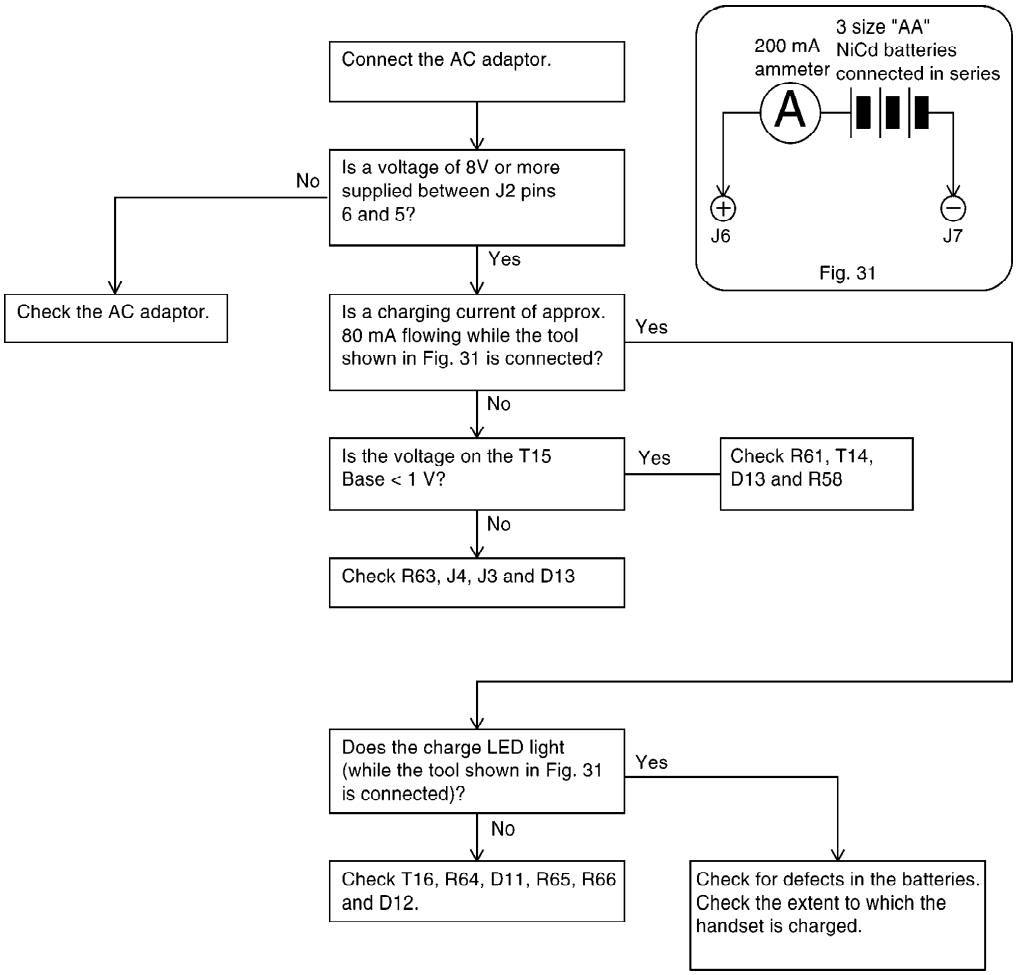

C
Disconnect and re-connect the base unit's AC adaptor.
Does the LCD Display remain on, and is the handset number displayed?
Yes
The password is wrong. Set a new password.
No
The base unit has a hardware (EEPROM, etc.) defect.

16.3. HANDSET: DOES NOT LINK

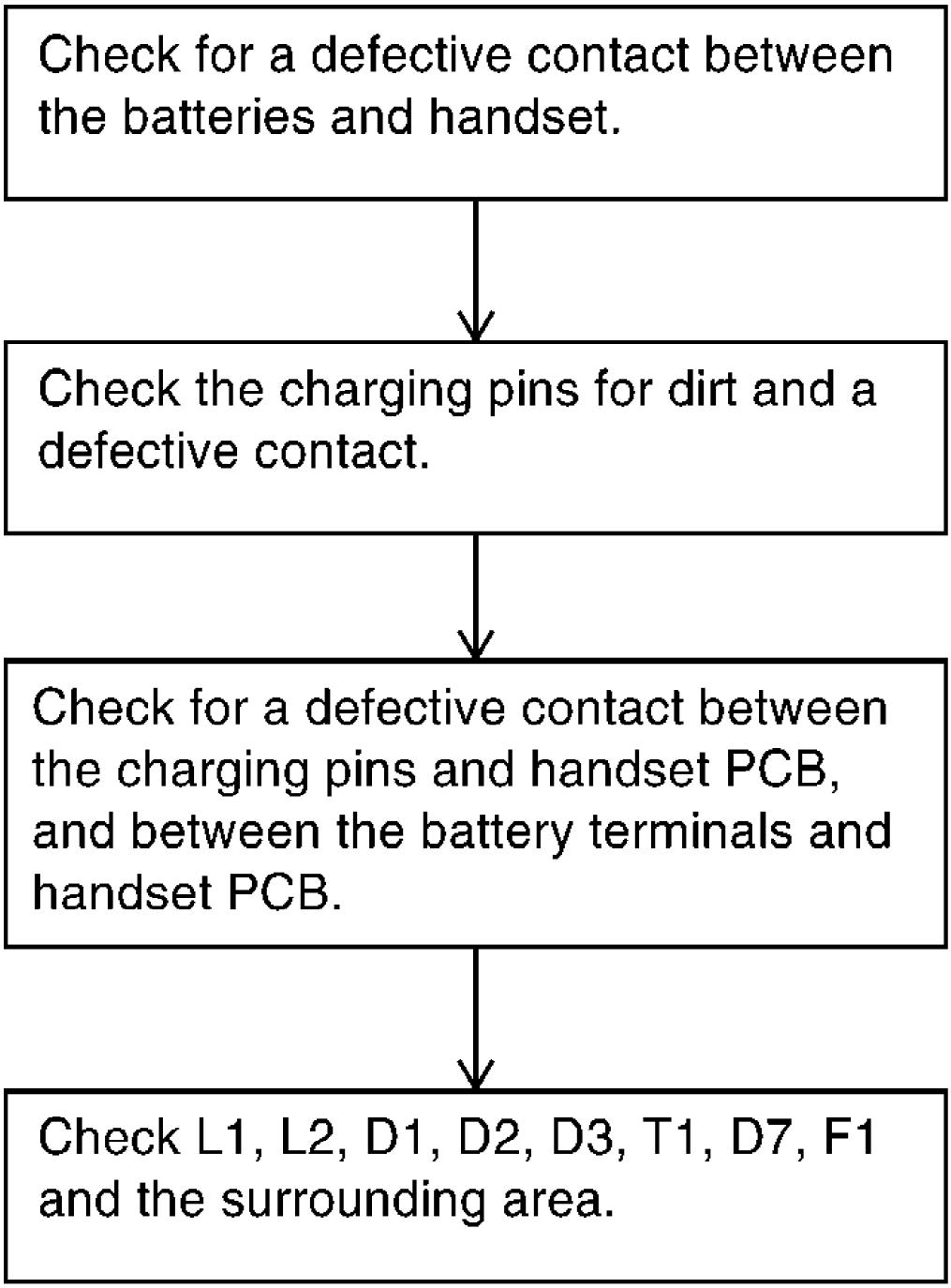

3
Does the signal output from IC1 pin 10 (TP56) of the handset have a frequency of 10.368 MHz ± 40 Hz when the AC adaptor for the base unit has been disconnected?
Adjust the clock frequency to 10.368 MHz ± 40 Hz.
Yes
Conduct an evaluation test on the RF unit of the handset (follow check procedure B). OK?
OK
NG
Check the RFM1, IC1 and X1 soldering.
Fails to link (base unit)?
Yes
Clear the handset registration data in the base unit.

(Refer to **14.6. TELEPHONE LINE TESTS.**)

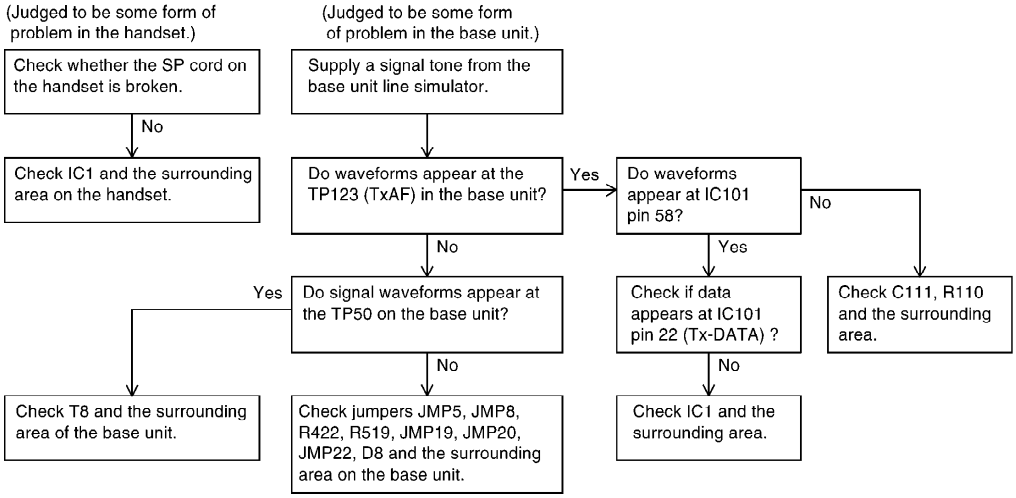
16.4. BASE UNIT: DOES NOT CHARGE


Connect the AC adaptor.
Is a voltage of 8V or more supplied between J2 pins 6 and 5?
No
Yes
Check the AC adaptor.
Is a charging current of approx. 80 mA flowing while the tool shown in Fig. 31 is connected?
Yes
No
Is the voltage on the T15 Base < 1 V?
Yes
Check R61, T14, D13 and R58
No
Check R63, J4, J3 and D13
Does the charge LED light (while the tool shown in Fig. 31 is connected)?
Yes
No
Check T16, R64, D11, R65, R66 and D12.
Check for defects in the batteries. Check the extent to which the handset is charged.
200 mA ammeter
3 size "AA" NiCd batteries connected in series
A
J6
J7
Fig. 31

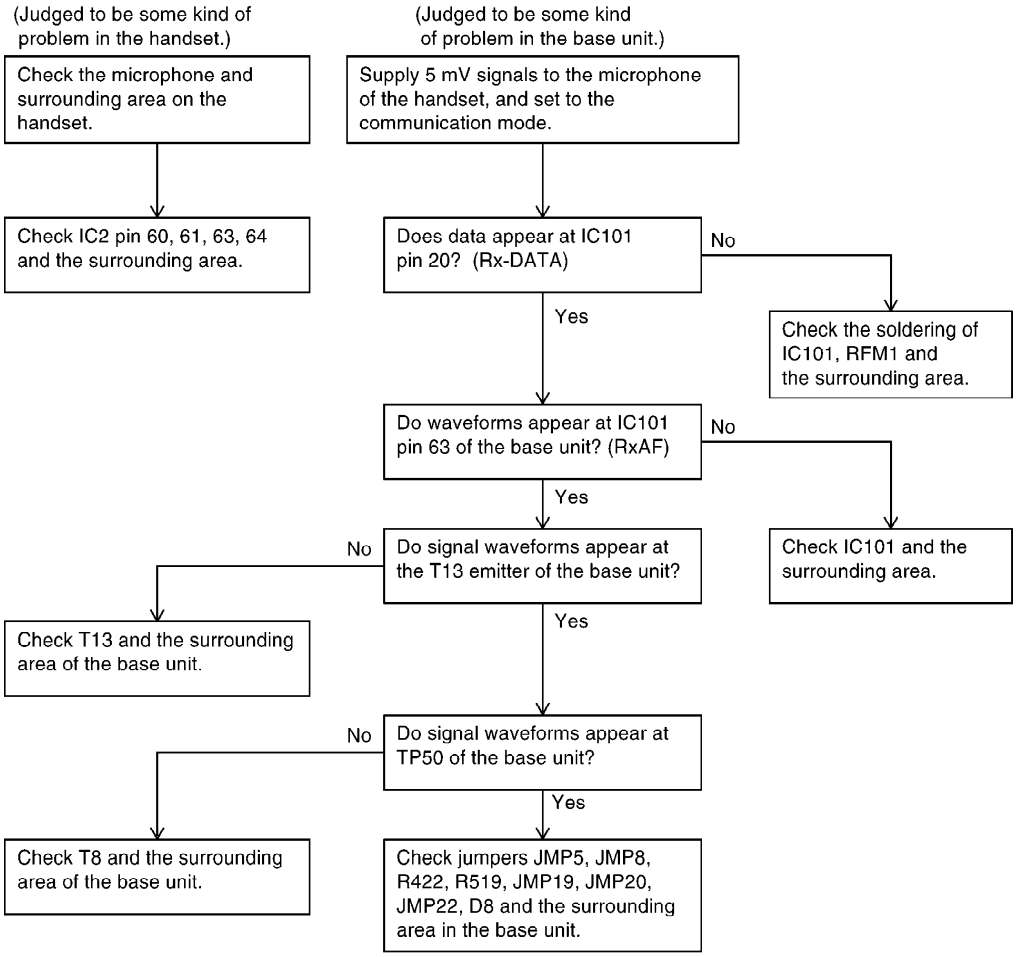
16.5. HANDSET: DOES NOT CHARGE


Check for a defective contact between the batteries and handset.
Check the charging pins for dirt and a defective contact.
Check for a defective contact between the charging pins and handset PCB, and between the battery terminals and handset PCB.
Check L1, L2, D1, D2, D3, T1, D7, F1 and the surrounding area.

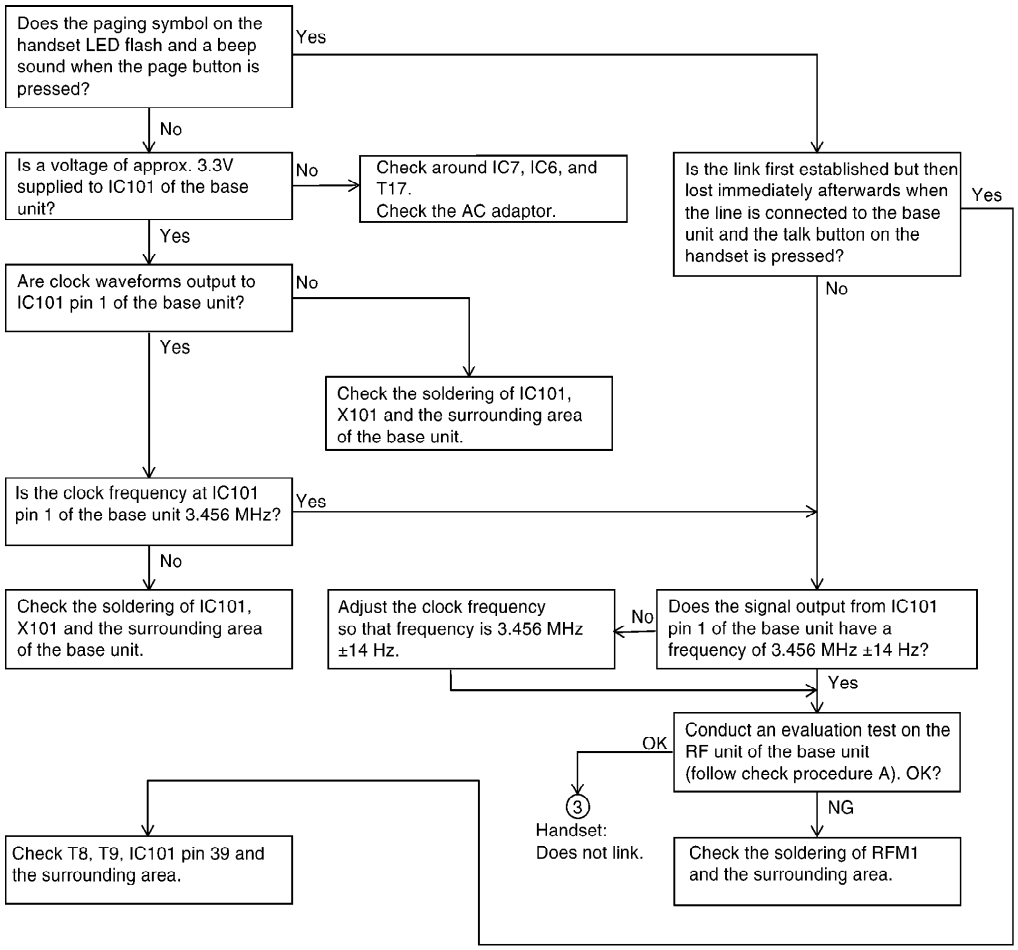
16.6. NO VOICE RECEPTION


(Judged to be some form of problem in the handset.)
(Judged to be some form of problem in the base unit.)
Check whether the SP cord on the handset is broken.
Supply a signal tone from the base unit line simulator.
No
Check IC1 and the surrounding area on the handset.
Do waveforms appear at the TP123 (TxAF) in the base unit?
Yes
Do waveforms appear at IC101 pin 58?
No
No
Yes
Yes
Do signal waveforms appear at the TP50 on the base unit?
Check if data appears at IC101 pin 22 (Tx-DATA) ?
Check C111, R110 and the surrounding area.
No
No
Check T8 and the surrounding area of the base unit.
Check jumpers JMP5, JMP8, R422, R519, JMP19, JMP20, JMP22, D8 and the surrounding area on the base unit.
Check IC1 and the surrounding area.

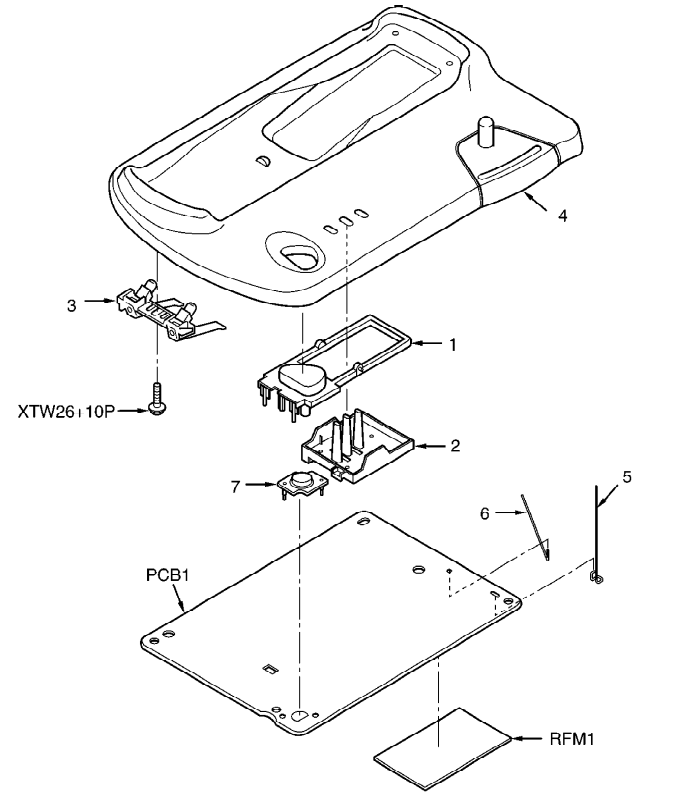
16.7. NO VOICE TRANSMISSION

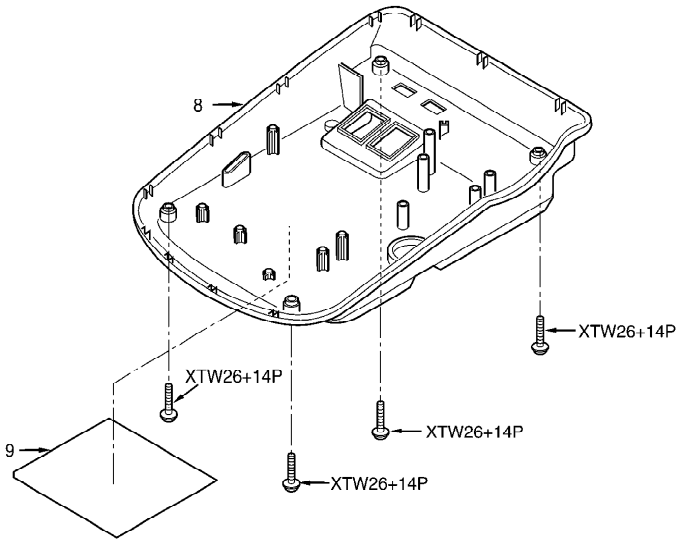

(Judged to be some kind of problem in the handset.)
(Judged to be some kind of problem in the base unit.)
Check the microphone and surrounding area on the handset.
Supply 5 mV signals to the microphone of the handset, and set to the communication mode.
Check IC2 pin 60, 61, 63, 64 and the surrounding area.
Does data appear at IC101 pin 20? (Rx-DATA)
No
Yes
Check the soldering of IC101, RFM1 and the surrounding area.
Do waveforms appear at IC101 pin 63 of the base unit? (RxAF)
No
Yes
No
Do signal waveforms appear at the T13 emitter of the base unit?
Check IC101 and the surrounding area.
Yes
Check T13 and the surrounding area of the base unit.
No
Do signal waveforms appear at TP50 of the base unit?
Yes
Check T8 and the surrounding area of the base unit.
Check jumpers JMP5, JMP8, R422, R519, JMP19, JMP20, JMP22, D8 and the surrounding area in the base unit.

16.8. BASE UNIT: DOES NOT LINK


Does the paging symbol on the handset LED flash and a beep sound when the page button is pressed?
Yes
No
Is a voltage of approx. 3.3V supplied to IC101 of the base unit?
No
Check around IC7, IC6, and T17.
Check the AC adaptor.
Yes
Are clock waveforms output to IC101 pin 1 of the base unit?
No
Check the soldering of IC101, X101 and the surrounding area of the base unit.
Yes
Is the clock frequency at IC101 pin 1 of the base unit 3.456 MHz?
Yes
No
Check the soldering of IC101, X101 and the surrounding area of the base unit.
Adjust the clock frequency so that frequency is 3.456 MHz ±14 Hz.
No
Does the signal output from IC101 pin 1 of the base unit have a frequency of 3.456 MHz ±14 Hz?
Yes
Is the link first established but then lost immediately afterwards when the line is connected to the base unit and the talk button on the handset is pressed?
Yes
No
Conduct an evaluation test on the RF unit of the base unit (follow check procedure A). OK?
OK
NG
③
Handset:
Does not link.
Check T8, T9, IC101 pin 39 and the surrounding area.
Check the soldering of RFM1 and the surrounding area.

17. CABINET AND ELECTRICAL PARTS LOCATION (BASE UNIT)

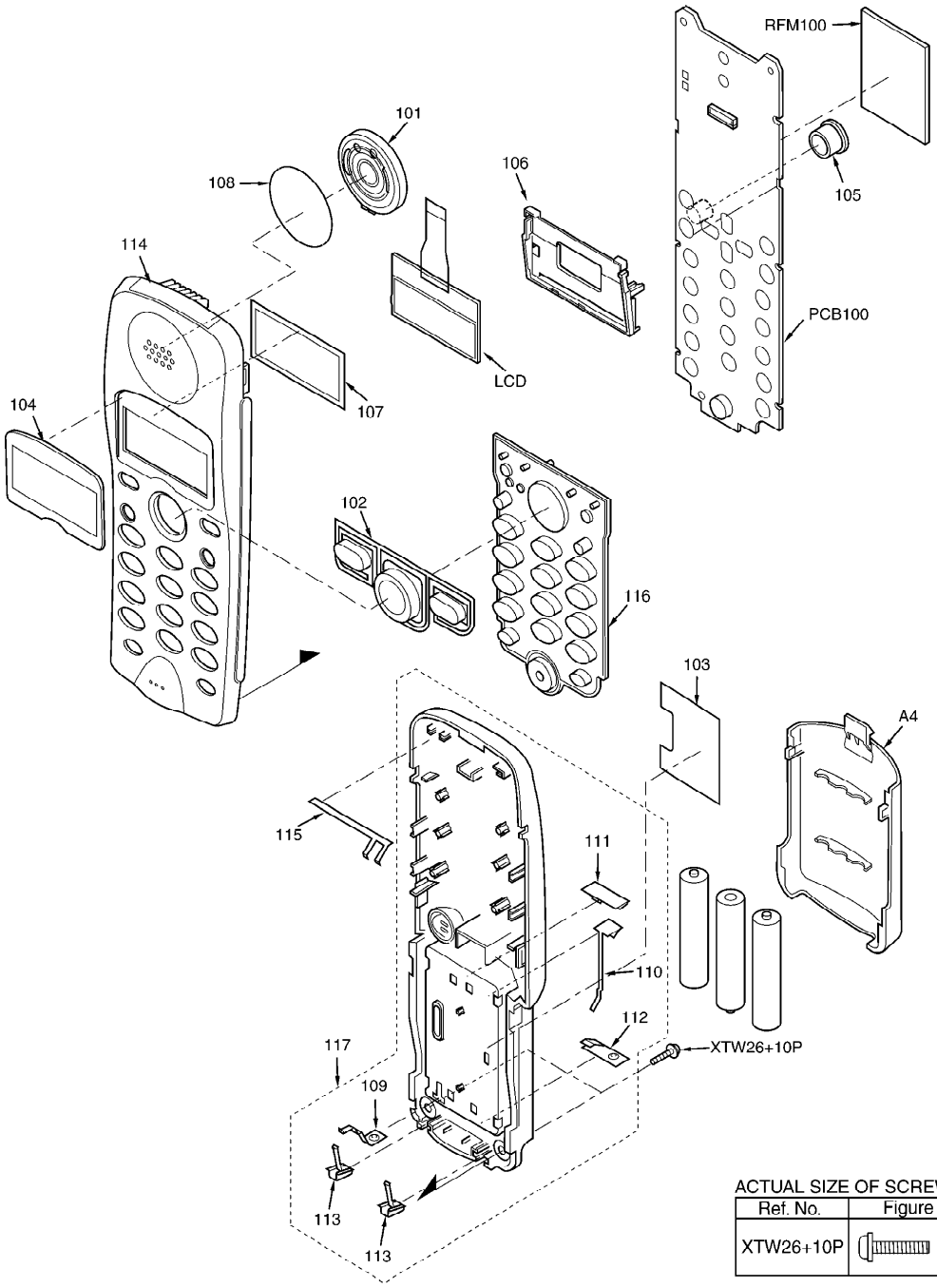




ACTUAL SIZE OF SCREWS

Ref. No.	Figure
XTW26+10P	
XTW26+14P	

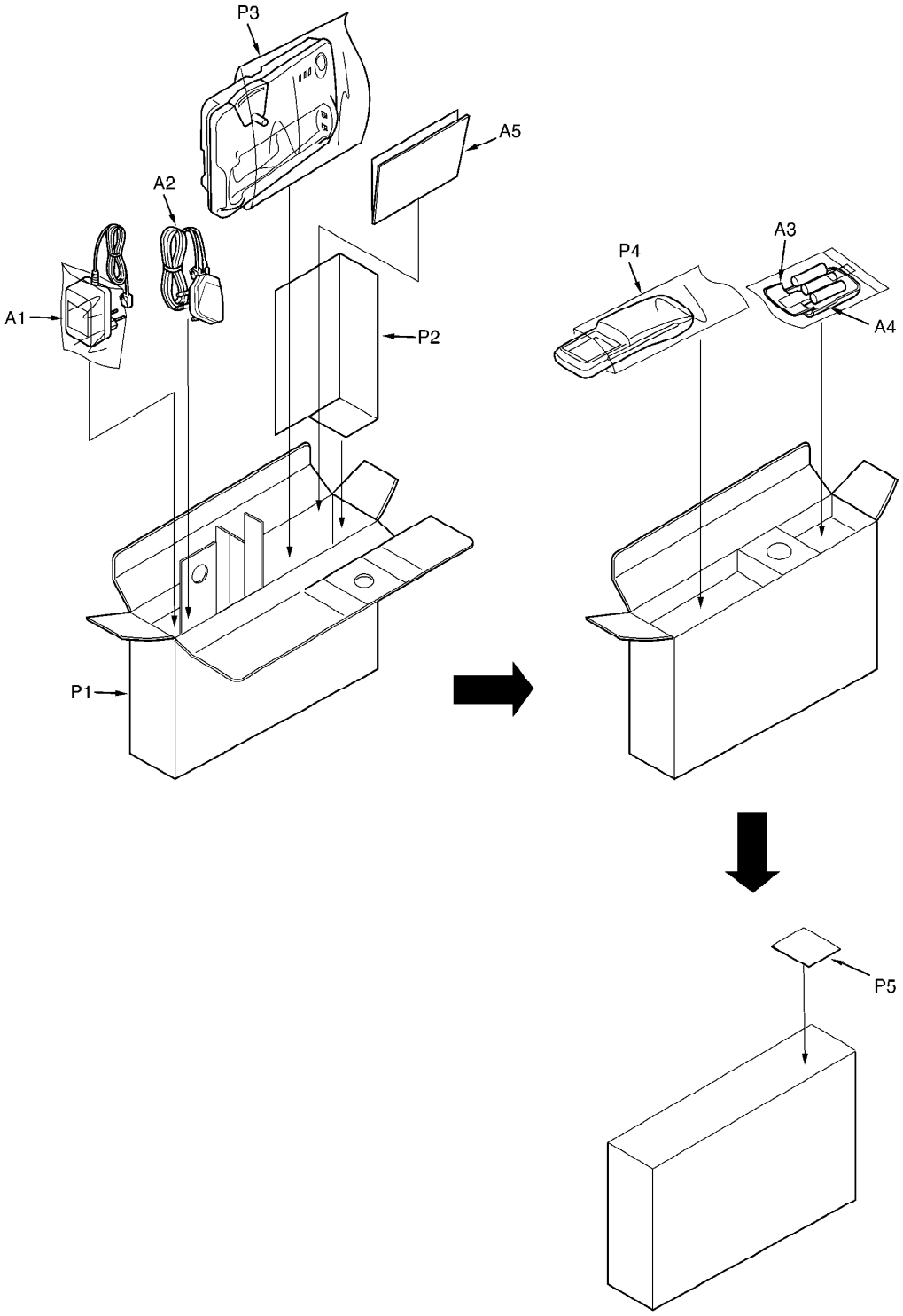
18. CABINET AND ELECTRICAL PARTS LOCATION (HANDSET)



ACTUAL SIZE OF SCREWS

Ref. No.	Figure
XTW26+10P	

19. ACCESSORIES AND PACKING MATERIALS



20. REPLACEMENT PARTS LIST

This replacement parts list is for KX-TCD952NLB only.
Refer to the simplified manual (cover) for other areas.
Notes:

1. The marking (RTL) indicates that the Retention Time is limited for this item.

After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing parts and product retention.
After the end of this period, the assembly will no longer be available.

2. **Important safety notice / Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacture's specified parts.**
3. **The S mark indicates service standard parts and may differ from production parts.**
4. **RESISTORS & CAPACITORS / Unless otherwise specified; / All resistors are in ohms (Ω) K=1000 Ω , M=1000k Ω / All capacitors are in MICRO FARADS (μ F) P= μ μ F / *Type & Wattage of Resistor**

Type

ERC:Solid ERD:Carbon PQ4R:Chip	ERX:Metal Film ERG:Metal Oxide ERO:Metal Film	PQRD:Carbon PQRQ:Fuse ERF:Wire Wound

Wattege

10,16,18:1/8W	14,25,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	5:5W

ECFD:Semi-Conductor ECQS:Styrol PQCBX,ECUV:Chip ECMS:Mica	ECCD,ECKD,PQCBC,PQVP : Ceramic ECQM,ECQV,ECQE,ECQU,ECQB : Polyester ECEA,ECSZ,ECOS : Electrolytic ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H : 50V 2A : 100V 2E : 250V 2H : 500V	05 : 50V 1 : 100V 2 : 200V	OF : 3.15V 1A : 10V 1V : 35V OJ : 6.3V	OJ : 6.3V 1A : 10V 1C : 16V 1E,25 : 25V	1V : 35V 50,1H : 50V 1J : 63V 2A : 100V

20.1. Base Unit

20.1.1. CABINET AND ELECTRICAL PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
1	PQBC10270Z3	PAGE BUTTON	S
2	PQHR10648Y	LED LENDS	
3	PQJT10165Z	BATTERY TERMINAL	
4	PQKM10369Y1	UPPER CABINET	S
5	PQSA10078Z	ANTENNA	
6	PQSA10079Z	ANTENNA	
7	PQSX10099Z	RUBBER SWITCH	
8	PQYF10146Z1	LOWER CABINET	S
9	PQGT14238Z	NAME PLATE	

20.1.2. MAIN P.C.BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB1	PQWPCD952NLH	MAIN P. C. BOARD ASS'Y (RTL)	
		(ICS)	
IC4	PQVILMV321M5	IC	
IC6	PQVIMC295130	IC	
IC7	PQVILM1117MP	IC	
IC101	PQVINS14424V	IC	
IC102	PQWICD952NLH	IC	
IC103	PQVIT2432WM6	IC	
		(TRANSISTORS)	
T6	2SA1037K	TRANSISTOR(SI)	
T7	PQVTBCP5216T	TRANSISTOR(SI)	S
T8	2SA1807NT	TRANSISTOR(SI)	
T9	PQVTBF822T7	TRANSISTOR(SI)	
T13	2SD1994A	TRANSISTOR(SI)	
T14	2SD601A	TRANSISTOR(SI)	
T15	2SD1664Q	TRANSISTOR(SI)	
T16	2SA1037K	TRANSISTOR(SI)	
T101	PQVTBC80725T	TRANSISTOR(SI)	S
T102	UN521	TRANSISTOR(SI)	S
T103	UN521	TRANSISTOR(SI)	S
		(DIODES)	
D2	PQVDBZV55C02	DIODE(SI)	
D3	PQVDBZV55C02	DIODE(SI)	
D4	MA110	DIODE(SI)	
D8	PQVDS1ZB60F1	DIODE(SI)	
D10	MA1Z300	DIODE(SI)	
D11	MA112	DIODE(SI)	
D13	MA8180	DIODE(SI)	
D101	MA110	DIODE(SI)	
D104	PQVDHVU359	DIODE(SI)	
D105	MA8047	DIODE(SI)	
		(LEDS)	
D12	LNJ211R8ARU	DIODE(SI)	
D102	LNJ311G8TRU	DIODE(SI)	

Ref. No.	Part No.	Part Name & Description	Remarks
D103	LNJ311G8TRU	DIODE(SI)	
		(VARISTOR)	
SA3	PQVDDSS301L	VARISTOR	
		(JACKS)	
J1	PQJJ1T018Z	JACK/SOCKET	
J2	PQJJ1T019Z	JACK/SOCKET	
		(CRYSTAL OSCILLATOR)	
X101	PQVCF1036N4Z	CRYSTAL OSCILLATOR	
		(PHOTO ELECTRIC TRANSDUCER)	
IC2	PQVIPC357CN	PHOTO ELECTRIC TRANSDUCER	
		(OTHERS)	
BUZ101	PQEFBC12111B	BUZZER	
		(RESISTORS)	
R3	PQ4R18XJ472	4.7k	
R4	ERJ3GEYJ103	10k	
R5	PQ4R18XJ565	5.6M	
R6	ERJ3GEYJ334	330k	
R7	PQ4R18XJ565	5.6M	
R8	ERJ3GEYJ334	330k	
R13	ERJ3GEYJ223	22k	
R14	ERJ3GEYJ223	22k	
R19	ERJ3GEYJ394	390k	
R20	ERJ3GEYJ393	39k	
R21	ERJ3GEYJ394	390k	
R22	ERJ3GEYJ393	39k	
R30	PQ4R18XJ000	0	
R31	ERJ3GEYJ130	13	
R32	PQ4R18XJ562	5.6k	
R33	ERJ1WY152	1.5k	
R34	ERJ1WY152	1.5k	
R35	ERJ3GEYJ104	100k	
R36	PQ4R18XJ272	2.7k	
R39	ERJ3GEYJ103	10k	
R40	ERJ3GEYJ222	2.2k	
R41	ERJ3GEYJ333	33k	
R43	ERJ3GEYJ560	56	
R49	ECUV1H100DCV	10P	
R53	ERJ3GEY0R00	0	

Ref. No.	Part No.	Part Name & Description	Remarks
R54	ERJ3GEYJ273	27k	
R55	ERJ3GEYJ223	22k	
R56	ERJ12YJ390	39	
R57	ERJ14YJ8R2	8.2	
R58	ERJ3GEYJ473	47k	
R59	ERJ3GEYJ331	330	
R60	ERJ3GEYJ152	1.5k	
R61	ERJ3GEYJ102	1k	
R62	ERJ3GEYJ101	100	
R63	PQ4R10XJ8R2	8.2	
R64	PQ4R10XJ1R5	1.5	
R65	ERJ3GEYJ101	100	
R66	PQ4R10XJ122	1.2k	
R67	ERJ3GEYJ102	1k	
R68	ERJ3GEYJ202	2k	
R69	ERJ3GEYJ224	220k	
R70	ERJ3GEYJ332	3.3k	
R101	ERJ3GEYJ102	1k	
R102	ERJ3GEYJ103	10k	
R103	ERJ3GEYJ151	150	
R104	ERJ3GEYJ151	150	
R105	ERJ3GEYJ105	1M	
R106	ERJ3GEYJ105	1M	
R107	ERJ3GEYJ101	100	
R108	ERJ3GEYJ560	56	
R110	ERJ3GEYJ101	100	
R111	ERJ3GEYJ101	100	
R112	ERJ3GEYJ273	27k	
R113	ERJ3GEYJ332	3.3k	
R114	ERJ3GEYJ1R0	1	
R115	ERJ3GEYJ100	10	
R116	ERJ3GEYJ102	1k	
R117	ERJ3GEYJ101	100	
R118	ERJ3GEYJ103	10k	
R119	ERJ3GEYJ103	10k	
R120	ERJ3GEYJ103	10k	
R121	ERJ3GEYJ222	2.2k	
R122	ERJ3GEYJ100	10	
R130	ERJ3GEYJ100	10	
R135	ERJ3GEY0R00	0	
R136	ERJ3GEYJ222	2.2k	
R422	ERDS1VJ000	0	
R519	ERDS1VJ000	0	
JMP5	PQ4R10XJ000	0	
JMP8	PQ4R10XJ000	0	

Ref. No.	Part No.	Part Name & Description	Remarks
JMP19	PQ4R10XJ000	0	
JMP20	PQ4R10XJ000	0	
JMP22	PQ4R10XJ000	0	
JMP202	ERJ3GEY0R00	0	
JMP203	ERJ3GEY0R00	0	
JMP204	ERJ3GEY0R00	0	
JMP207	ERJ3GEY0R00	0	
		(CAPACITORS)	
C1	ECUV1C104KBV	0.1	
C2	ECQE2474KF	0.47	
C3	ECUV1H102KBV	0.001	
C4	ECUV1H102KBV	0.001	
C10	PQCUV1C105ZF	1	
C12	ECUV2H102KB	0.001	
C13	ECUV1H102KBV	0.001	
C14	ECUV2H102KB	0.001	
C15	ECUV1H102KBV	0.001	
C16	ECUV2H681KB	680P	
C17	ECUV2H681KB	680P	
C18	ECUV2H681KB	680P	
C21	ECEA1HKS100	10	
C22	ECUV1H103KBV	0.01	
C25	ECUV1H100DCV	10P	
C27	ECUV1H472KBV	0.0047	
C29	PQCUV1C224KB	0.22	
C33	ECUV1C104KBV	0.1	
C34	PQCUV1H104ZF	0.1	S
C35	PQCUV1H683KB	0.068	
C36	ECEA1HKS2R2	2.2	
C38	ECUV1H103KBV	0.01	
C39	ECUV1C105KB	1	
C40	ECEA1CK101	100	S
C41	ECUV1H100DCV	10P	
C42	ECEA1CK101	100	S
C43	PQCUV1C224KB	0.22	
C44	ECUV1H100DCV	10P	
C45	ECEA0JK221	220	S
C47	ECUV1C225ZF	2.2	
C48	ECUV1C225ZF	2.2	
C101	ECUV1H101JCV	100P	
C102	ECUV1H103KBV	0.01	
C103	ECUV1H102KBV	0.001	
C104	ECUV1H390JCV	39P	
C105	ECUV1H390JCV	39P	

Ref. No.	Part No.	Part Name & Description	Remarks
C106	PQCUV1C224KB	0.22	
C107	PQCUV1C105ZF	1	
C108	ECUV1H100DCV	10P	
C109	PQCUV1C224KB	0.22	
C110	ECUV1H100DCV	10P	
C111	ECUV1C104KBV	0.1	
C112	ECUV1H100DCV	10P	
C113	ECUV1C104KBV	0.1	
C114	PQCUV1C105ZF	1	
C115	ECUV1H100DCV	10P	
C116	ECST0JY106	10	
C117	PQCUV1C105ZF	1	
C118	ECUV1H100DCV	10P	
C123	ECUV1H102KBV	0.001	
C125	PQCUV1H681JC	680P	
C136	PQCUV1C224KB	0.22	
C137	ECUV1H100DCV	10P	
C139	ECUV1C104KBV	0.1	
C140	ECUV1C104KBV	0.1	
C141	ECUV1C104KBV	0.1	
C142	ECUV1C104KBV	0.1	
C143	ECUV1C104KBV	0.1	
C144	ECUV1C104KBV	0.1	
C145	ECUV1C104KBV	0.1	
C146	ECUV1H101JCV	100P	
C147	ECUV1H220JCV	22P	
C148	ECUV1H220JCV	22P	
C150	ECUV1H100DCV	10P	
C151	ECUV1H100DCV	10P	
C152	ECST0JY106	10	
C156	PQCUV1H683KB	0.068	
C160	ECUV1H100DCV	10P	
C161	ECUV1H100DCV	10P	
C162	ECUV1H100DCV	10P	
		(RF UNIT PARTS)	
RFM1	PQLZ10008Z	RF BLOCK	

20.2. Handset

20.2.1. CABINET AND ELECTRICAL PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
101	PQAX3P26Z	SPEAKER	
102	PQBX10324Z1	FUNCTION BUTTON	S
103	PQGT14109Z	NAME PLATE	
104	PQGP10145Z1	LCD PANEL	S
105	PQHG10486Z	RINGER RUBBER	
106	PQHR10649Y	LCD HOLDER	
107	PQHR10651Z	LCD SPONGE	
108	PQHS10342Z	SPEAKER NET	
109	PQJC10035Z	BATTERY TERMINAL	
110	PQJC10036Z	BATTERY TERMINAL	
111	PQJC10037Z	BATTERY TERMINAL	
112	PQJC904Y	BATTERY TERMINAL	
113	PQJT10143Z	BATTERY TERMINAL	
114	PQKM10370X1	FRONT CABINET	S
115	PQSA10085Z	ANTENNA	
116	PQSX10100Z	RUBBER KEYPAD	
117	PQYF10149Y1	REAR CABINET	S

20.2.2. MAIN P.C.BOARD PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
PCB100	PQWPCD952GRA	MAIN P. C. BOARD ASS'Y (RTL)	
		(ICS)	
IC1	PQWICD952GRA	IC	
		(TRANSISTORS)	
T1	PQVTBC80825T	TRANSISTOR(SI)	S
T2	UN521	TRANSISTOR(SI)	S
T3	PQVTBC80825T	TRANSISTOR(SI)	S
T5	PQVTBC81825T	TRANSISTOR(SI)	S
		(DIODES)	
D1	PQVDBYD17D	DIODE(SI)	
D2	PQVDBZD27C18	DIODE(SI)	S
D3	MA112	DIODE(SI)	
D4	PQVDBZD27C18	DIODE(SI)	S
D5	MA112	DIODE(SI)	
D6	PQVDBZD27C56	DIODE(SI)	S
D7	PQVDHRU0203A	DIODE(SI)	S
D11	MA110	DIODE(SI)	
D12	PQVDHVU359	DIODE(SI)	
D13	MA8047	DIODE(SI)	
		(COILS)	
L1	ELJPA100KF	COIL	
L2	ELJPA100KF	COIL	

Ref. No.	Part No.	Part Name & Description	Remarks
F1	PQLQR2M5N6K	COIL	
		(OTHERS)	
LCD	PQADS404HB	LIQUID CRYSTAL DISPLAY	
A101(+)	PQJT10152Y	ANTENNA	
A101(-)	PQJT10152Y	ANTENNA	
BZ1	PQEFBC12111B	BUZZER	S
J1	PQJT10090Z	BATTERY TERMINAL	S
J2	PQJT10090Z	BATTERY TERMINAL	S
J3	PQJT10090Z	BATTERY TERMINAL	S
J4	PQJT10090Z	BATTERY TERMINAL	S
M1	PQJM146Z	MICROPHONE	
X1	PQVCF1036N3Z	CRYSTAL OSCILLATOR	
J9	PQJS30B11Z	CONNECTOR	
LS2(+)	PQJT10161Z	SPEAKER TERMINAL	
LS2(-)	PQJT10161Z	SPEAKER TERMINAL	
		(RESISTORS)	
R1	ERJ3GEYJ103	10k	
R2	PQ4R10XJ122	1.2k	
R3	PQ4R18XJ471	470	
R4	ERJ3GEYJ682	6.8k	
R5	ERJ3GEYJ103	10k	
R6	ERJ3GEYJ153	15k	
R7	ERJ3GEYJ104	100k	
R14	ERJ3GEYJ563	56k	
R15	ERJ3GEYJ104	100k	
R16	ERJ3GEYJ563	56k	
R17	ERJ3GEYJ104	100k	
R18	ERJ3GEYJ102	1k	
R19	ERJ3GEYJ102	1k	
R20	ERJ3GEYJ105	1M	
R21	ERJ3GEYJ105	1M	
R22	ERJ3GEYJ100	10	
R23	ERJ3GEYJ100	10	
R24	ERJ3GEYJ101	100	
R25	ERJ3GEYJ101	100	
R27	ERJ3GEYJ101	100	
R28	ERJ3GEYJ101	100	
R29	ERJ3GEYJ471	470	
R30	ERJ3GEYJ471	470	
R31	ERJ3GEYJ102	1k	

Ref. No.	Part No.	Part Name & Description	Remarks
R32	ERJ3GEYJ102	1k	
R33	ERJ3GEYJ822	8.2k	
R34	ERJ3GEYJ332	3.3k	
R35	ERJ3GEYJ1R0	1	
R36	ERJ3GEYJ100	10	
R37	ERJ3GEYJ102	1k	
R38	ERJ3GEYJ101	100	
R44	ERJ3GEYJ103	10k	
R47	ERJ3GEYJ103	10k	
R48	ERJ3GEYJ103	10k	
R49	ERJ3GEYJ104	100k	
R50	ERJ3GEYJ563	56k	
R51	ERJ3GEYJ104	100k	
C56	ERJ3GEYJ332	3.3k	
		(CAPACITORS)	
C1	PQCUV1E104MD	0.1	
C2	ECUV1C104KBV	0.1	
C3	ECEV1AA101	100	
C4	ECUV1H100DCV	10P	
C5	PQCUV1C224KB	0.22	
C6	ECUV1H100DCV	10P	
C7	PQCUV1C105ZF	1	
C9	ECUV1C104KBV	0.1	
C10	ECUV1H100DCV	10P	
C11	ECUV1H103KBV	0.01	
C12	ECUV1H102KBV	0.001	
C13	ECUV1H390JCV	39P	
C14	ECUV1H390JCV	39P	
C15	ECUV1H100DCV	10P	
C16	ECUV1H100DCV	10P	
C17	ECUV1H100DCV	10P	
C18	ECUV1H100DCV	10P	
C19	PQCUV1A105KB	1	
C20	ECUV1H100DCV	10P	
C22	ECUV1H472KBV	0.0047	
C23	ECUV1H472KBV	0.0047	
C24	PQCUV1H563KB	0.056	
C25	ECUV1H100DCV	10P	
C26	ECUV1H100DCV	10P	
C27	PQCUV1C105ZF	1	
C28	ECST0JY106	10	
C29	PQCUV1C105ZF	1	
C30	ECST0JY106	10	
C35	ECUV1H102KBV	0.001	
C37	PQCUV1H681JC	680P	
C47	PQCUV1C224KB	0.22	

Ref. No.	Part No.	Part Name & Description	Remarks
C48	ECUV1H100DCV	10P	
C50	ECUV1C104KBV	0.1	
C51	ECUV1C104KBV	0.1	
C52	ECUV1C104KBV	0.1	
C53	ECUV1C104KBV	0.1	
C54	ECUV1C104KBV	0.1	
C55	ECUV1C104KBV	0.1	
C65	ECUV1H100DCV	10P	
C66	ECUV1H100DCV	10P	
C67	ECUV1H100DCV	10P	
C68	ECUV1H100DCV	10P	
C71	ECUV1C104KBV	0.1	
C72	PQ4R10XJ000	0	
C73	ECUV1H101JCV	100P	
C74	PQCUV1H102J	0.001	S
C75	PQCUV1H102J	0.001	S
C77	ECUV1H100DCV	10P	
		RF UNIT PARTS	
RFM100	PQLZ10007Z	RF BLOCK	

20.2.3. ACCESSORIES AND PACKING MATERIALS

Ref. No.	Part No.	Part Name & Description	Remarks
A1	KX-TCA11CE	AC ADAPTOR	⚠
A2	PQJA10036Z	TEL CORD	⚠
A3	PQKE10071Z1	BELT CLIP	S
A4	PQKK10091Z1	BATTERY COVER	S
A5	PQQX12744Z	INSTRUCTION BOOK	
P1	PQPK13093Z	GIFT BOX	
P2	PQPD10443Z	CUSHION	
P3	PQPP10085Z	PROTECTION COVER (for Base Unit)	
P4	PQPP10084Z	PROTECTION COVER (for Handset)	
P5	PQGT14238Z	NAME PLATE	

20.3. MEMO

21. CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (BASE UNIT)

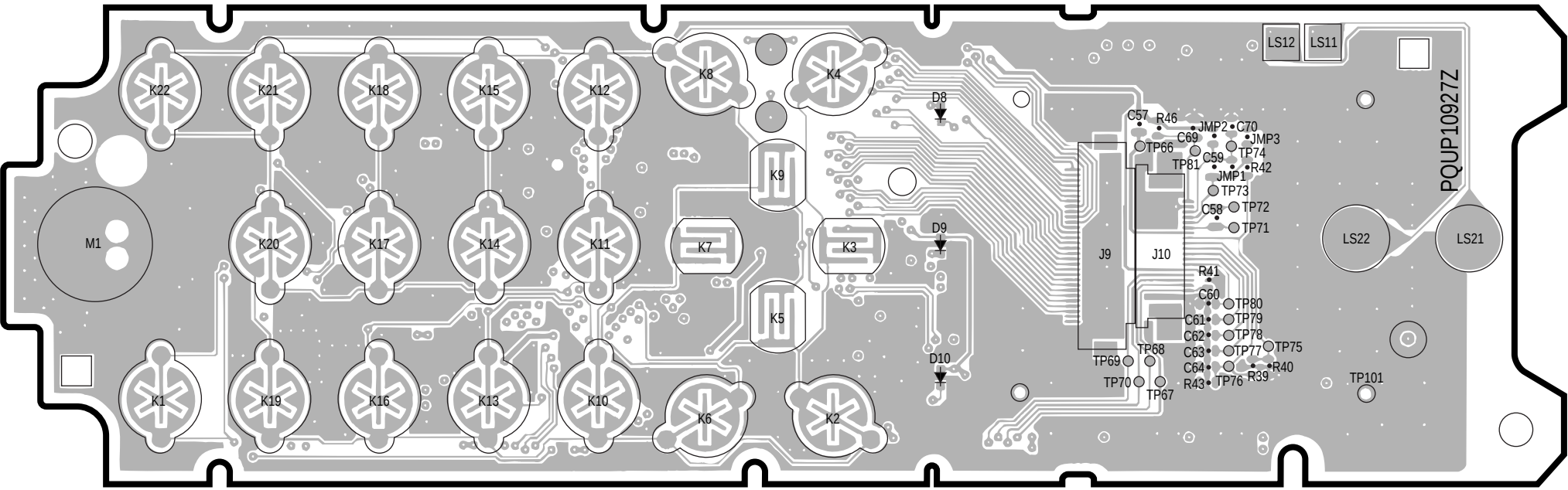
21.1. CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (HANDSET)

22. SCHEMATIC DIAGRAM (BASE UNIT)

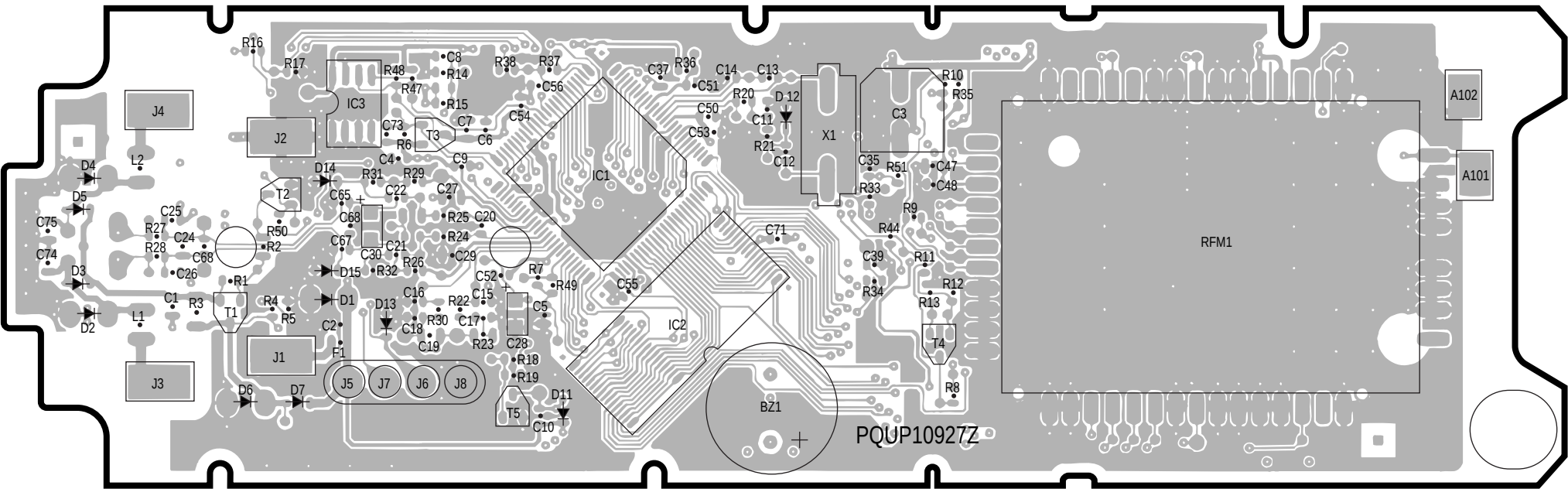
22.1. SCHEMATIC DIAGRAM (HANDSET)

U (Q) / KXTCD952NLB-UK / Printed in Japan

(Component View)



(Flow Solder Side View)



LINE VOLTAGE 48V DC

48V DC

EARTH

+3V

PULSE TO 0V
DURING RINGING

Bell

OPTION5

OPTION4

OPTION2

OPTION5

1.5V

1.5V

1.5V

1.5V

1.5V

1.5V

0.1V

CLIP
(Caller ID)

CHARGE
PULSE

RING

EARTH

PULSE_DIAL

CLIP_STATE

CHARGE_PULSE

CLIP

PULSE_LIN

HOOK

RXAF

TXAF

REV_POL

LINE_SENSE

+48V ON-HOOK
+10.2V OFF-HOOK

+0.1V ON-HOOK
+10.0V OFF-HOOK

+46V ON-HOOK
+48V OFF-HOOK

+0V ON-HOOK
+0.7V OFF-HOOK

+2.5V (ON-HOOK)

+9.9V (ON-HOOK)

+2.5V (ON-HOOK)

+1.9V (ON-HOOK)

0V

TX •AF

RX •AF

+11.8V

11.5V
(ON-CHARGE)

HAND SET 6V
(ON-CHARGE)

10.8V
(ON-CHARGE)

1.3V
(ON-CHARGE)

+3.9V

VUNREG

+3V

POWER
ON

0

t

60msec 200msec

RESET

+3.9V

0V

(LED ON)

+2V

+3V

+0.05V

Caller
GREEN

HOOK
GREEN

+0.05V

+3V

AD10

AD11

AD09

AD08

AD13

AD14

AD17

AD16

AD15

AD12

AD07

AD06

AD05

AD04

AD00

AD01

AD02

AD03

FREQ 3.456MHz
+3V
0V

1.7V
0.1V
10.368MHz

1.7V
0.6V
10.368MHz

TX-DATA

RX-DATA

A201
Antenna

A202
Antenna

RFM1

IC101

IC102

IC103

IC104

IC2

IC3

IC4

IC6

IC7

T1

T2

T4

T5

T6

T7

T8

T9

T11

T12

T13

T14

T15

T16

BUZ101

X101
10.368MHz

D8

D10

D101

D102

D103

D104
HVU359

D105
4V7

D11

D12
RED

D13
18V

K101

SA1

SA3

SA4A

SA4B

SA5

SY-9-K

J1

J2

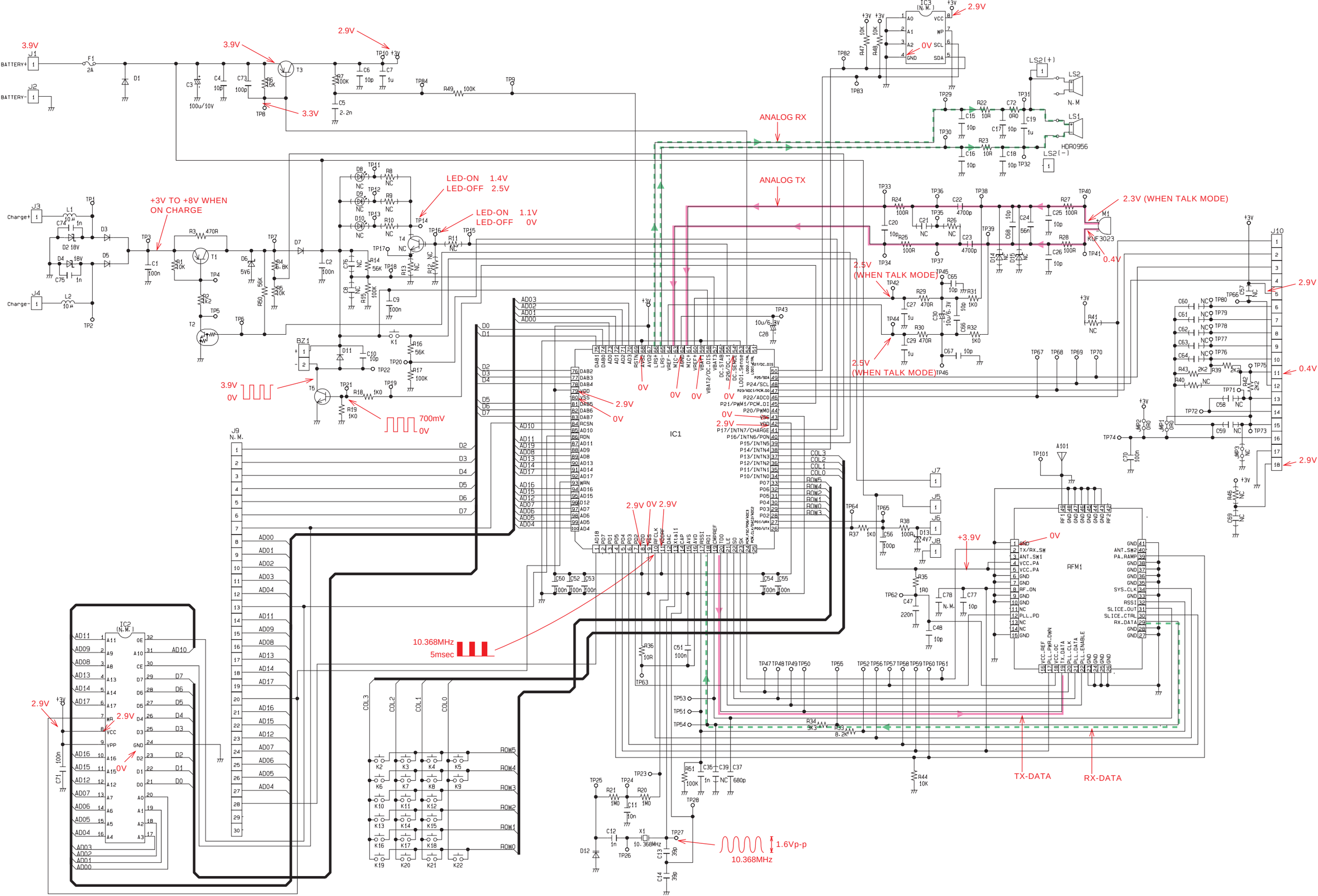
J3 Positive charge terminal

J4 Negative charge terminal

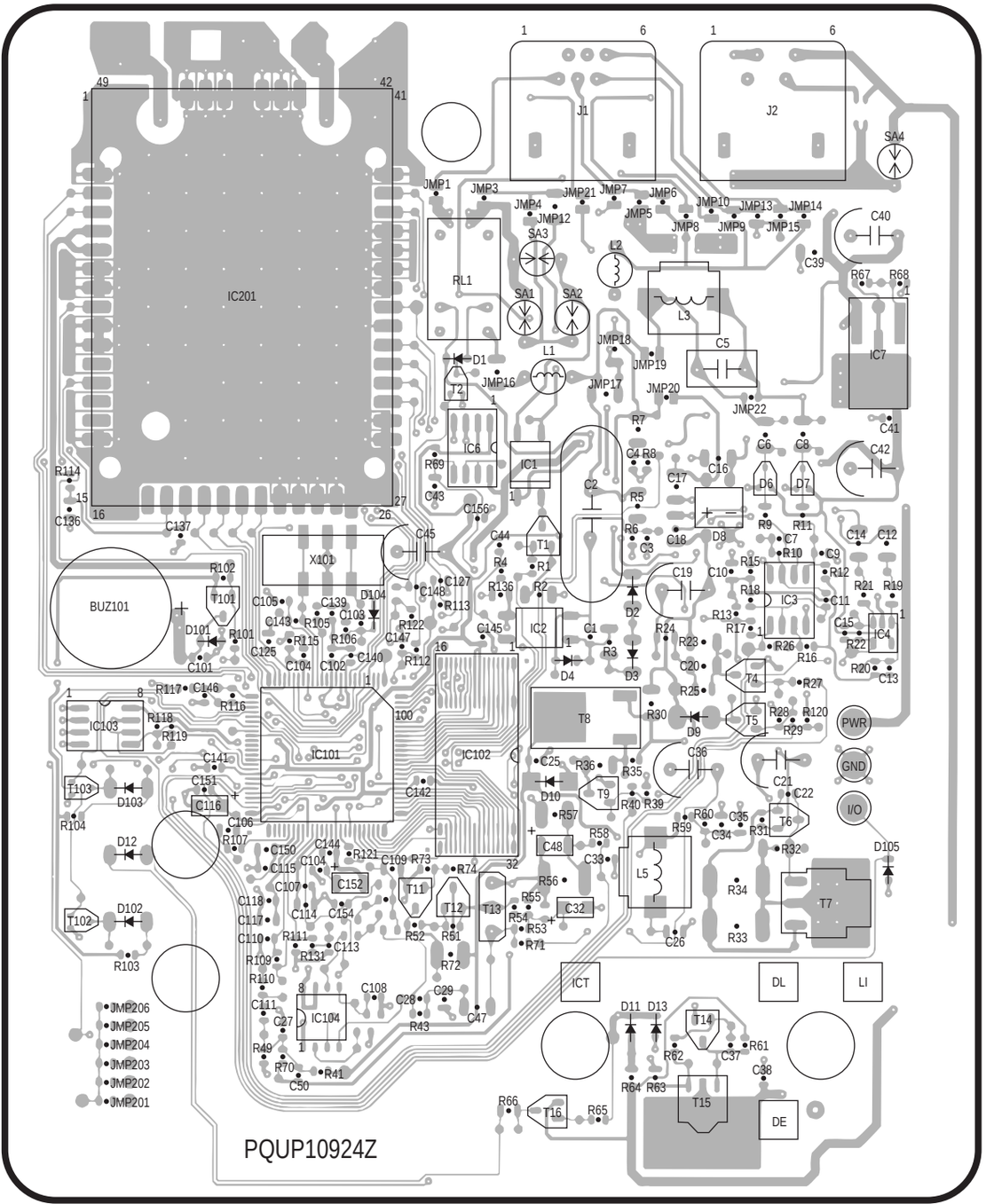
J101

J102

J103


3.9V
BATTERY+
BATTERY-
F1
2A
D1
100u/10V
3.3V
2.9V
TP10 +3V
R49 100K
ANALOG RX
ANALOG TX
LED-ON 1.4V
LED-OFF 2.5V
LED-ON 1.1V
LED-OFF 0V
+3V TO +8V WHEN ON CHARGE
Charge+
Charge-
D2 18V
D4 18V
D2 5V6
IC3 (N.M.)
A0
A1
A2
GND
VCC
WP
SCL
SDA
0V
LS2(+)
LS2
N. M
LS1
HDR0956
LS2(-)
2.3V (WHEN TALK MODE)
KUF3023
0.4V
2.5V (WHEN TALK MODE)
IC1
J9 N. M.
J10
AD00
AD01
AD02
AD03
AD04
AD05
AD06
AD07
AD08
AD09
AD10
AD11
AD12
AD13
AD14
AD17
AD19
D0
D1
D2
D3
D4
D5
D6
D7
ROW0
ROW1
ROW2
ROW3
ROW4
ROW5
COL0
COL1
COL2
COL3
10.368MHz
5msec
700mV
1.6Vp-p
10.368MHz
IC2 (N.M.)
RFM1
A101
TX-DATA
RX-DATA

(Component View)



(Flow Solder Side View)